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RAILWAY NEEDS AND THE RECOVERY PROGRAM

EDITORIALS

GENERAL ARTICLES

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RAILWAY AGE

Railway Needs and the Recovery Program

Should the railways increase their capital and maintenance expenditures? If so, why? For what should they make increased expenditures? Can increased expenditures be financed and, if so, how? These questions are asked at a juncture that is unprecedented in the history of the United States, because it is due to what almost amounts to a deadlock between government and business.

Both government and business desire economic recovery. Recovery plainly began in the last one-third of 1932, was arrested in the first quarter of 1933, was resumed in the second quarter of 1933 and continued through July, and has since been retarded in exactly the part of 1933 in which it began in 1932. Freight car loadings are the best single measure of total production and commerce. A normal seasonal increase in weekly freight car loadings between March and July is 5½ per cent. In 1933 the increase was 35 per cent. A normal increase between July and October is 15 per cent. In 1932 it was 30 per cent, while in 1933 it has been only 6 per cent. In July, 1933, average weekly car loadings were 28½ per cent greater than in July, 1932, while in the three weeks ended on October 14, they were only 4 per cent greater than in 1932, and in the week ended on October 14 only 1½ per cent greater.

Other indexes of general business show the same upturns and downturns during the last fifteen months. No amount of special pleading or ballyhoo can refute the plain facts that the total volume of production and commerce determines the amount of national income available to be divided among all classes of the people, and that their trend, after having been upward in the last one-third of 1932, and upward again until almost the end of July, has since been steadily downward, until now business is little or no better than a year ago.

Government Versus Business

Walter Lippmann, a "liberal" who formerly was associate editor of the New Republic, but who is one of our ablest and most discriminating writers on problems of government and economics, said in an article published in the New York Herald-Tribune last week, and syndicated by it to newspapers throughout the country, "It is a stalemate, and I do not see how it can be broken until both Washington and Wall Street make up their minds on matters of fundamental principle, and then act upon their decisions". There is truth in this statement, but it expresses too narrow a view. The recession in business that has occurred since July is due quite as much to conditions and sentiment on Main Street as in Washington and Wall Street. Certain of the recovery policies of the administration have been causing resentment and fear among most business men, large and small, throughout the country. This is even more true in rural communities than in large cities, and it is the principal cause of the recent recession in business.

The administration has been making the mistake of assuming that the psychology and action of other classes are more important in bringing about economic recovery than those of business men, and that whatever might otherwise be lacking, but needed, in the psychology and action of business men could be supplied by the compulsion of threats of boycotts, legal proceedings and ballyhoo. In the economic system of this country, however, the middle class are very numerous, far more important than the working class, and too powerful to be coerced; and the course of the administration in giving so much more encouragement to socialistic economists, labor leaders and wage-earners than to the great army of business men, large and small, who in the long run must supply the capital, brains and enterprise required to revive business and increase employment, has been creating business sentiment and conditions that are highly inimical to economic recovery.

Government and the Railways

No other industries are feeling more keenly the adverse effects of these policies and conditions than the railroad industry and the railway equipment and supply manufacturing industry. As statistics given above

show, railway traffic increased much more than normally from March to July, and continued until recently to be greater than last year, with the result that railway gross and net earnings, employment and purchases have increased until recently. Meantime, the government has shown an increasing desire to make loans with which to enable the railways to enlarge their expenditures, but the railways have manifested little disposition to accept them, and the decline of business which recently has been occuring, will, if it is not soon arrested, curtail railway expenditures, unless money is derived from some other source than current earnings with which to increase them.

The condition approaching a deadlock between the government and the railroads regarding loans is not due to unwillingness of the railways to aid in economic recovery, but to a dislike by the railways of going further into debt to a government which, in its dealings with most business men, shows a tendency to want to dictate terms to them, regardless of how unfavorable they may be from the standpoint of those to whom they are offered. When the administrators of government policies recognize that business men usually do not borrow and spend to increase employment and purchases solely for the patriotic purpose of promoting recovery, any more than labor leaders and working men seek increased employment or advances in wages and shorter hours of work solely for the same patriotic purpose, and begin to act in accordance with this plain fact, the government will begin to make more progress with its recovery program. Fortunately, there is evidence that the administrators of the government's policies are beginning to realize that if they are to aid in promoting the revival of business they must rely more upon methods that will tend to inspire business men with hope and less with resentment and fear.

No Increase in Railway Capacity Needed

It is now generally accepted as a fact by government administrators, economists and business men that one of the most vital essentials to a renewal of the revival of business is a large increase in purchases from the "capital goods" industries. The railways are normally among the very largest customers of these industries, and this issue of the *Railway Age* is devoted principally to showing in some detail the developments that have occurred and the conditions that now exist in the railroad industry which demonstrate, from the standpoint of both the public and the railways, the need for a large increase in railroad buying.

The railroads are confronted at present with two conditions with which they were never confronted before at the same stage of any depression. One of these is, that they do not need to make the capacity of their facilities any greater than it was when the depression began. The other is that they do need to make unprecedented changes in their facilities and service in order to meet new conditions, and especially new competition.

The reason why there is no need for such an increase in railway capacity as was required following every past depression is obvious. During the decade which preceded the present depression railway facilities were largely expanded. Meantime, there was an unprecedented decline in railway passenger business and an unprecedentedly small increase in railway freight business. The result was that at the peak of business in 1929 the railways had sufficient surplus capacity to have easily handled an increase in business equal to that which had occurred in the previous decade. There being apparently no reason for expecting during the decade ending with 1939 a larger increase in traffic than occurred in the decade ending with 1929, it would appear that a restoration of railroad capacity to what it was in 1929 would make it sufficient, or more than sufficient, during the next decade.

Deferred Maintenance, Obsolescence and Competition

When we turn to phases of the railroad situation, other than that of capacity, we find ourselves confronted with conditions and problems of a very different character. Expenditures for the maintenance of permanent structures and equipment have been drastically reduced throughout the last four years. Capital expenditures for new equipment and improvements have been drastically reduced throughout the last three years. The railways are confronted with new competition, especially by highway which may be made less effective by changes in government policies of subsidization and regulation, but no legislation will obviate the necessity for expensive changes in facilities and service if the new competition is to be adequately met. These conditions raise very directly the question as to what the railways should increase their expenditures for when they are enabled to increase them.

Estimates of the amount of deferred maintenance that needs to be made up always are necessarily inexact, and such estimates at present are greatly complicated by two questions. One of these is as to how large a part of existing equipment and other facilities is in such bad condition or has become so obsolete, because of the availability of better similar facilities, that it would be cheaper to replace it than to keep it in, or return it to, service. The other is as to how much of the kinds of equipment and facilities now in service should be retired by the substitution of entirely new kinds of equipment and facilities entirely for the purpose of meeting new kinds of competition. Because of prolonged drastic retrenchments and of new competition the questions of capital expenditures and deferred maintenance have become entangled, and the way in which they should be dealt with on each railway depends in large measure upon the extent to which the service it needs to render is now, and may be expected to be, affected by non-railway competition.

How Much Traffic Is Affected by Competition?

There undoubtedly is a tendency in some quarters to exaggerate the extent to which railway facilities

and service must be changed in order to meet non-railway competition. This, of course, has a direct bearing upon the question as to the kinds of facilities upon which the railways should make expenditures, both capital and maintenance. The railways always have been mass producers of transportation, and it has been mass production that has enabled them throughout their entire development to reduce their unit costs and rates in proportion to the wages and prices they have had to pay.

The United States is still a country of long distances, the greater part of whose commerce consists of bulky commodities, such as coal, ore, lumber, grain, and so on. It is essential to the cheap transportation of such bulky commodities by rail that they shall be hauled in large carloads and long trainloads, and the principal competitors of the railways for their transportation are carriers by ocean, the great lakes and a few rivers on which traffic is handled in large loads. Only for short distances and to a limited extent is there effective truck competition for bulky commodities. It seems to follow that what the railroads need, and for an indefinite period will continue to need, for the handling of the major part of their freight tonnage—probably at least 80 per cent of it—are improved facilities such as those with which they now handle freight business.

Because of the competition of automobiles and airplanes, the elements of speed and frequency of service are more important in passenger than in freight transportation, but even for the purpose of handling that large part of their passenger business which moves in sleeping cars and for long distances in coaches, it seems probable that the principal need of the railways is for improvements in such facilities, especially cars, as they now use, these improvements being needed to increase speeds and comfort, and at the same time effect economies that will make it possible to stand reductions of rates that will attract more business.

Economy-Producing Facilities Already Available

Before the depression began there had been made available improved equipment, especially locomotives, and, also, improved signaling and interlocking, track tools, shop tools, accounting machinery, and many other kinds of facilities, the substitution of which for a large part of those in use would have effected large economies in operation, in addition to the very large economies that were effected by similar means in the decade before the depression. The possibilities of effecting economies by the installation of the most improved equipment and other facilities have been greatly increased during the depression, both by the further development of improved facilities, and by the unprecedented accumulation of deferred maintenance. As articles published elsewhere in this issue show, the deferring of maintenance of both permanent structures and equipment has resulted in a large part of railway facilities deteriorating until the operating expense of restoring them to a serviceable condition would be almost or quite prohibitive as compared with the capital and operating costs that would be incurred if they were replaced with improved facilities, while the great reductions of capital expenditures during the last three years have caused obsolescence to accrue to an extent that it never did before.

Probably the most important problem that will confront the railways as their traffic increases will be that, not only of preventing great increases in their operating expenses, but of reducing them. They cannot do this if they keep in or restore to service facilities that are obsolete or virtually worn out and correspondingly increase their expenditures for maintenance. They can do it only by using their available financial resources to the utmost in replacing as rapidly as possible facilities that are obsolete or virtually worn out with facilities of the most improved types, which will render the maximum of service with the minimum of operating expense. Moreover, at a time when revenues and operating performance must be watched so closely, the further mechanization of accounting work merits careful consideration not only to assure a prompt and adequate check on all operations but to reduce accounting expenses as well.

Meeting Highway Competition

While there is danger of exaggeration of the extent to which railway facilities and service need revolutionizing, especially to meet competition, it is nevertheless evident to all well-informed students of the railroad problem that great changes are needed in those facilities which must be used in competition with highway transportation if such competition is to be met effectively.

The extent to which the railways should try to meet automobile competition is a debatable question. If it is to be met to any considerable extent by rail, excepting in territories where the population is so dense that the railways can afford to render frequent service with trains drawn by steam locomotives, it will probably have to be met with self-propelled cars or trains with new kinds of power which can be run at short intervals at a much lower capital and operating cost than trains drawn by steam locomotives. In most parts of the country the railways probably will have to use buses more largely in co-ordination with their rail service if they are to meet automobile and bus competition at a reasonable cost.

The meeting of truck competition will require many changes in facilities and service which probably will include store-door collection and delivery of freight, the use of trucks to replace or extend railway service outside of terminal areas, the use of containers or other equipment to render continuous truck-rail-truck service, and the use of lighter trains operated at more frequent intervals.

The problem of meeting highway competition involves numerous difficulties, and its solution will be

expensive, but undoubtedly progress is being made in the development of means of solving it.

The Problem of Financing

The most immediately pressing problem that must be solved, if railway capital and maintenance expenditures are to be substantially increased, is the problem of financing them. If the railroads could go into the market and get from private investors the money required to enable them to make expenditures with which to improve their facilities, and thereby reduce their prospective operating expenses, they unquestionably would do so. They cannot do so because the financial market is closed to most of them by their lack of credit and by the huge demands being made upon it by the government. An early substantial increase in railway expenditures is therefore largely dependent upon the adoption of some co-operative program by the government and the railways under which the government will make loans on terms which it will be to the advantage of the railways to accept.

There is available for the railways $400,000,000 in the public works fund. If they borrowed it all, their indebtedness to the government would be increased to less than $800,000,000, an amount considerably smaller than they borrowed from it during the war, practically all of which was soon liquidated. If its expenditure would have the stimulating effect upon general business that most students of the problems of recovery believe that it would have, the government could much better afford to loan this $400,000,000 to the railways at a low rate of interest, for a long period of years, and without imposing any terms regarding its expenditure that would be objectionable to railway managements, than it could to make any other use of it whatever.

In fact, its expenditure by the railways, in accordance with the judgment of their managements, would be far more beneficial to the nation in the long run than any, or perhaps all, of the other expenditures that the government is making or proposing to make in carrying out its public works program.

British Roads Winning Passenger Traffic Fight

British railways, for several years after the inception of the downward trend in the number of passengers carried by them at standard rates, attempted, through the operation of special excursions and offers of restricted low fares, to mitigate the adverse effect on revenues of the decline in regular travel. It was not, however, until this year's "Summer holiday fares" were announced that the low rates were made generally applicable; on May 1 round-trip rates at a penny (approximately 2 cents) a mile were inaugurated for tickets valid on virtually all trains. Preliminary results of this experiment, which amounted to a reduction in basic passenger rates, should be of particular interest in this country where Western railroads are about to launch, and Eastern roads about to watch, a similar experiment.

It is, therefore, a timely analysis of the British experiment which is presented in a recent issue of the Railway Gazette (London). Briefly, this analysis compares gross passenger revenues earned by railways of Great Britain during the 1933 "Summer holiday period" (May 1 to September 30) with those for the corresponding 1932 period. It reveals that this year's gross for the 22 weeks involved was £542,000 in excess of that for 1932, whereas for the 1933 period prior to the installation of the generally-applicable reductions (January 1 to May 1) the gross passenger revenues were £338,000 less than those of the first four months of 1932.

Included in the Gazette's analysis is a chart on which are plotted, separately by weeks, the May 1-September 30 gross passenger revenues for the years 1933, 1932 and 1928, the latter being included because, "in addition to being a comparatively good traffic year" it is otherwise comparable with 1933 since its August bank holiday peak falls in the same week as did this year's. The 1933 curve of this chart reaches peaks higher than those of the 1932 curve for both Whitsuntide and August bank holiday travel but the Gazette finds "the more encouraging feature of the graph as a whole" to be its showing "that the 1933 outline, although throughout much lower, does conform more closely in shape to that of 1928 than does that of 1932."

Thus it would seem that British roads are at last winning their fight for passenger business. It is true that these are gross and not net revenue figures and also that passenger traffic has undoubtedly been affected favorably by improved business conditions in Britain.

It nevertheless appears that results shown make out a prima facie case in substantiation of the oft-repeated contention of *Railway Age* to the effect that, with respect to the passenger traffic problem, the first consideration should be to fix rates and offer services which will bring travelers back to the rails. This was the tack taken in Britain. During the first few years in which railroads there were extending their experiments in fare reductions they found themselves carrying more passengers while gross passenger revenues continued to decline. Now, however, their persistence and enterprise would appear to be in a fair way to reap its just reward in the form of increased passenger revenues.

Maintenance Expenses Down Three Billions Since 1929

Fell further than traffic but now, with it, are on the upgrade—"Repair or replace?" is important question

THE expenditures of the railways for the maintenance of their equipment, permanent way and structures have declined from 1930 to the present by a cumulative total of approximately three billion dollars under the average annual outlay for the years 1925-1929 inclusive. This does not, of course, mean that they have suffered physical deterioration to that extent, nor does it suggest that the principal task facing the railways is to restore existing plant and equipment rather than to meet the deficiency largely by replacing older rolling stock, motive power and other facilities by the purchase of modern and more efficient machines which will obviate the necessity for reconditioning the old. Further analysis will be necessary before the question—How rehabilitate the railways?—can be answered, and to this other articles in this issue are devoted.

The fact remains, however, that had maintenance activity alone been continued on the railways since 1929 at the volume and at wages and prices which prevailed in the five pre-depression years, there would have found their way into the pockets of railway employees and the merchants they patronize, and into the treasuries of suppliers of railway materials, approximately three billions of dollars which did not get there because the railroads did not have it to spend. The extent of this decline is outlined in detail for each year of the depression by classes of maintenance expenses for the three major territorial divisions and for the country as a whole in Table I.

Do Not Vary with Traffic Volume

It is obvious that the way out of the situation in which the railways find themselves is not to spend as nearly as may be to this sum on their present plant. First from this total there must be deducted those maintenance outlays which can, with no injury to the property, be curtailed or stopped as traffic declines. In transportation expenses there is a very close parallel between the volume of traffic and the outlay. If a train is not operated there is no crew to whom to pay wages and no fuel to be consumed; hence transportation expenses decline. This is not true with maintenance expenses however; at least, not to the same degree. The volume of traffic has little to do with the cost of maintaining track. Even in the case of freight cars, it has been estimated that 30 per cent of the maintenance cost is due to weather and climatic conditions rather than to the operation of the car, and this deterioration will go on whether the car is in use or not.

An equally important consideration is the change in cost of labor and materials; both of these are lower than they were during the boom; hence a smaller sum than that actually expended in the boom period would serve today to provide the same physical volume of maintenance. It is evident, therefore, that the decline in maintenance expenses cannot alone serve as a measure of accumulated work which must be made up. Much of the deterioration which would have occurred had the industry continued to operate as it did from 1925 to 1929, actually has not occurred because of a reduction in the use of the facilities.

Obsolescence a Factor of Growing Importance

In a period of economic stagnation such as we have experienced in the past three years the factor of obsolescence acquires an importance which it would be difficult to overemphasize. There exists at least the possibility that this factor may have in large measure counteracted the savings in maintenance expenses justified by reduced utilization of the plant. When an industry is rapidly expanding and all of its facilities are being used to capacity, obsolescence need scarcely be considered at all. The industry has constantly to add to

Table I—Railway Maintenance Expenses

	Five-year average 1925-1929	1930	1931	1932	7 months 1933	Cumulative decline below 5-yr. average 1930 to August 1, 1933
*Eastern District**						
Maintenance of Way Expenses.....	$394,917,100	$331,951,414	$249,716,720	$158,409,288	$81,167,757	$600,456,381
Maintenance of Equipment Expenses..	639,111,133	524,203,890	418,178,147	312,558,976	166,287,787	879,571,279
Total Maintenance Expenses.....	$1,034,028,233	$856,155,304	$667,894,867	$470,968,264	$247,455,544	$1,480,027,660
Southern Region						
Maintenance of Way Expenses.....	$117,627,013	$90,646,226	$75,680,761	$50,236,607	$24,978,288	$181,915,365
Maintenance of Equipment Expenses..	161,196,344	131,157,205	107,204,552	81,101,319	43,350,346	217,493,416
Total Maintenance Expenses.....	$278,823,357	$221,803,431	$182,885,313	$131,337,926	$68,328,634	$399,408,781
Western District						
Maintenance of Way Expenses.....	$337,018,667	$282,873,300	$205,215,409	$142,468,493	$71,751,431	$510,958,568
Maintenance of Equipment Expenses..	426,329,955	363,904,183	291,570,792	225,298,890	120,795,606	533,218,367
Total Maintenance Expenses.....	$763,348,622	$646,777,483	$496,786,201	$367,767,383	$192,547,037	$1,044,176,935
United States						
Maintenance of Way Expenses.....	$849,562,780	$705,470,940	$530,612,890	$351,114,388	$177,897,476	$1,293,330,314
Maintenance of Equipment Expenses..	1,226,637,434	1,019,265,278	816,953,491	618,959,185	330,433,739	1,630,283,068
Total Maintenance Expenses.....	$2,076,200,214	$1,724,736,218	$1,347,566,381	$970,073,573	$508,331,215	$2,923,613,382

* Including Pocahontas Region.

its plant to accommodate a growing volume of business and, of course, each addition is as modern and economical in character as is available at the time of purchase. Meanwhile, constant use of the older units of equipment wears them out before advances in invention have rendered them obsolete, i.e., workable but wasteful. The industry can keep reasonably abreast of progress without a formal policy any more complicated than that of buying the best equipment and plant obtainable when the necessity for it arises, and discarding the old when it is so worn that it will no longer function.

A period of depression, however, or a change from the characteristic of expansion to one of stability, renders unworkable the rule-of-thumb policy of acquiring new equipment or facilities solely to meet the demands of traffic, and discarding old equipment or plant only when it can no longer operate. Utilization of facilities may decline, and give them longer potential service life, but the vigor of inventive genius does not slow down.

The industry does not buy, because there is no need to expand capacity. Equipment and plant already owned wear out more slowly and potential service life increases. The process of modernization slows down, with the result that, in time, a considerable proportion of the plant may become obsolete, i.e., workable but wasteful by comparison with newer machines now available to perform the work. The extent to which this factor of obsolescence may have a bearing on the present railway maintenance situation is explored in some detail in other articles in this issue.

To sum up then: Maintenance outlays of the railways have declined cumulatively by approximately three billion dollars since the onset of the depression. This figure is not a measure of deterioration in plant investment, however, because facilities wear out less rapidly when use of them declines and because the cost of labor and materials is now lower than it was in the period from which the decline is measured. The lower utilization of plant and the sharp reduction in capital expenditures have given rise to the question: To what extent should rehabilitation of the railways consist in reconditioning existing plant and to what extent should it involve replacing it with new?

Great Decline in Roadway Maintenance

Maintenance of way has suffered relatively more than any other major item of railway operating expenses. The decline in operating revenues from 1929 to 1932 was 50.2 per cent, whereas that in maintenance of way expenses was 58.9 per cent. Bearing in mind the fact that deterioration of the permanent way is affected largely by the elements rather than the volume of traffic, this reduction in maintenance of way expenses to a degree in excess even of that in gross business is sufficient evidence alone of undermaintenance and destruction of the "fat" of previous years of high maintenance stand-

Table II—Comparison of Maintenance Expenses of Selected Large Railroads for the First Eight Months of 1933 With the Average for the Same Months of 1925-1929

Name of road	Maintenance of Way Expenses			Maintenance of Equipment Expenses		
	Average for 5 years	8 months 1933	Per cent decrease	Average for 5 years	8 months 1933	Per cent decrease
Alton	$2,427,053	$1,002,429	60	$4,338,378	$1,006,866	77
Atchison, Topeka & Santa Fe	21,746,918	8,434,918	61	26,170,190	15,235,177	42
Gulf, Colorado & Santa Fe	3,915,015	1,373,609	65	4,005,439	1,922,143	52
Atlantic Coast Line	7,720,356	3,184,750	59	10,892,350	4,925,699	55
Baltimore & Ohio	20,661,186	6,449,465	69	37,732,951	14,132,140	63
Boston & Maine	7,369,091	3,256,429	56	9,567,909	4,088,250	57
Central of Georgia	2,595,893	1,005,949	61	3,273,526	1,696,342	48
Central of New Jersey	3,807,420	1,250,336	67	8,166,401	3,272,322	60
Chesapeake & Ohio	12,272,483	7,972,844	35	19,952,206	12,325,901	38
Chicago & Eastern Illinois	1,993,427	975,085	51	4,209,959	1,114,335	74
Chicago & North Western	13,860,347	6,438,479	54	19,803,934	9,866,510	50
Chicago, Burlington & Quincy	14,691,841	4,933,811	66	18,652,567	7,758,434	58
Chicago Great Western	2,258,011	1,284,347	43	3,127,968	1,311,801	58
Chicago, Milwaukee, St. Paul & Pacific	17,627,602	6,243,390	65	23,076,110	11,402,569	51
Chicago, Rock Island & Pacific	11,446,422	4,072,128	64	18,171,249	8,523,411	53
Chicago, St. Paul, Minneapolis & Omaha	2,711,946	967,012	64	3,268,555	1,467,952	55
Delaware & Hudson	3,356,514	2,190,143	35	7,039,863	3,898,086	45
Delaware, Lackawanna & Western	5,593,640	2,565,153	54	10,350,011	5,581,830	46
Denver & Rio Grande Western	3,990,558	1,077,835	73	4,001,207	2,336,631	42
Elgin, Joliet & Eastern	1,596,598	624,006	61	3,513,004	1,396,214	60
Erie	8,726,443	3,828,359	56	17,750,534	8,792,798	50
Grand Trunk Western	1,739,143	1,661,309	4	3,009,872	2,236,716	26
Great Northern	11,003,443	3,313,544	70	12,320,441	7,240,620	41
Illinois Central System	16,324,543	4,213,130	74	26,953,266	10,934,567	59
Lehigh Valley	5,250,542	2,018,265	62	10,444,797	5,165,275	51
Louisville & Nashville	14,119,437	4,735,380	66	21,298,456	9,115,624	57
Minneapolis, St. Paul & Sault Ste. Marie	4,440,851	1,980,104	55	5,873,829	2,736,272	53
Missouri-Kansas-Texas	4,933,662	2,130,611	57	7,052,882	2,593,202	63
Missouri Pacific	13,841,929	5,349,860	61	16,628,046	8,873,588	47
New York Central	48,412,246	15,767,993	67	80,123,370	37,381,891	53
Pittsburgh & Lake Erie	2,889,662	718,664	75	7,058,171	3,094,272	56
New York, Chicago & St. Louis	4,609,708	1,867,596	59	6,887,386	3,047,417	56
New York, New Haven & Hartford	12,369,399	5,048,903	59	17,475,703	7,271,744	58
Norfolk & Western	9,884,388	4,465,170	55	14,229,404	8,381,572	41
Northern Pacific	9,160,368	3,769,728	59	12,026,474	7,376,396	39
Pennsylvania	56,433,805	16,999,613	70	96,669,827	41,009,145	58
Long Island	3,450,575	1,123,196	67	4,013,215	2,203,386	45
Pere Marquette	3,398,217	1,837,694	46	6,130,344	3,379,941	45
Reading	8,717,775	1,889,979	78	14,213,543	5,719,125	60
St. Louis-San Francisco	7,256,912	4,207,744	42	11,190,482	5,949,539	47
St. Louis Southwestern	3,208,229	934,931	71	3,069,864	1,177,779	62
Seaboard Air Line	5,067,047	3,205,519	37	6,596,519	4,171,018	37
Southern	14,281,725	5,601,824	61	17,480,620	9,206,926	47
Southern Pacific	19,192,744	5,987,202	69	23,567,906	11,497,566	51
Texas & Pacific	4,208,435	1,343,544	68	4,752,525	2,355,282	50
Union Pacific	9,163,506	3,054,561	67	14,910,452	7,806,630	48
Oregon Short Line	4,143,810	1,408,444	66	3,908,107	1,713,576	56
Oregon-Washington	3,576,992	1,262,572	65	2,976,735	1,143,456	62
Wabash	6,749,293	3,183,862	53	8,257,928	3,968,367	52

ards. The decline in maintenance of equipment expenses from 1929 to 1932 was 48.5 per cent and that in transportation expenses 44.3 per cent. Of the three major items included in operating expenses, the last mentioned —transportation expenses—should vary more nearly with the volume of business than either of the maintenance accounts, and the fact that it actually declined less proportionately than either of them is further conclusive evidence of an accumulation of deferred maintenance work.

Maintenance Expenses of Individual Roads

Maintenance policies being followed this year by some of the larger railroads are reflected in Table II, which shows their maintenance outlays for the first eight months of the current year as compared with the average for the same period in the five years 1925-1929. The table is not intended to tell the whole story and the figures shown, where they depart sharply from the mean, do not necessarily indicate such departure in actual physical conditions on that particular railroad. For example, a railroad may have in the period 1925-29 been engaged in building its track standards up to a high degree of perfection—to the end that it might be maintained thenceforth at greatly reduced expense. If this is the situation, as it undoubtedly was in the case of several railroads, then a reduction of, say, 60 to 70 per cent in the outlays of that particular road might be entirely consistent with an adequate maintenance policy under traffic conditions obtaining today, whereas a similar reduction by a carrier which was providing only necessary current maintenance in the years 1925-29 might reflect real deterioration. It is believed, however, that, combined with some knowledge of the maintenance policies, past and present, of the several roads, the figures which are shown may be properly informative.

Similarly with regard to maintenance of equipment, roads with higher ratios of new power and rolling stock would be expected to show sharper declines without reflecting the same volume of actual undermaintenance which such reductions on roads with a great deal of old equipment would show. Also, roads which have been retiring old equipment and charging its undepreciated value to profit and loss rather than to operating expenses would be favored in a tabulation such as this. The reader should, therefore, ascertain all the surrounding facts before forming any final opinions from the data shown in this table.

Table III—How Increased Maintenance Outlays Have Followed Larger Operating Revenues

	February	July	Per cent incr. July over Feb.
Eastern District			
Maintenance of Way Expenses	$8,598,438	$12,022,545	39.8
Maintenance of Equipment Expenses	19,855,591	23,854,221	20.1
Total Maintenance Expenses	28,454,029	35,876,766	26.1
Railway Operating Revenues	97,346,885	132,115,392	35.7
Southern District			
Maintenance of Way Expenses	4,871,255	5,871,784	20.5
Maintenance of Equipment Expenses	8,600,930	9,675,448	12.5
Total Maintenance Expenses	13,472,185	15,547,232	15.4
Railway Operating Revenues	43,893,003	54,130,459	23.3
Western District			
Maintenance of Way Expenses	8,126,486	12,506,683	53.9
Maintenance of Equipment Expenses	16,404,950	18,141,085	10.6
Total Maintenance Expenses	24,531,436	30,647,768	24.9
Railway Operating Revenues	70,373,016	107,462,448	52.7
United States			
Maintenance of Way Expenses	21,596,179	30,401,012	40.8
Maintenance of Equipment Expenses	44,861,471	51,670,754	15.2
Total Maintenance Expenses	66,457,650	82,071,766	23.5
Railway Operating Revenues	211,612,904	293,708,299	38.8

Maintenance Outlays Now on Upgrade

Railway maintenance programs have already shown a pronounced revival since the low point reached in February this year, as is shown in Table III, which compares maintenance outlays by districts in July with those in February. Similar figures for August and September, which are not available at this writing, will undoubtedly evidence an even more pronounced improvement. The upturn in roadway maintenance is particularly gratifying in view of the low level to which it had sunk. It is true, of course, that the increase of 40.8 per cent shown in this item for July over February is partly seasonal in character. The increase for the summer month over February in 1929, however, was only 15 per cent and in 1932 there was scarcely any increase at all in July over February. The increase in maintenance of equipment expenses in July over February, 15.2 per cent, while much less than that in maintenance of way, compares with an increase of 7 per cent in July over February, 1929, and with a sharp decline in the summer month last year, when compared with the February outlay. The smaller increase in maintenance of equipment expenses is explainable also by the fact that there still exists a considerable surplus, whereas in the case of roadway expenditure to insure continued safe operation has been imperative. Unsafe or broken down rolling stock does not prohibit the operation of the railroad, since it can be placed on a siding out of the way. All of the roadway, by contrast, must be kept constantly in usable condition.

Recondition or Replace?

What, then, is the total of deferred maintenance on the railways? How much will it cost to rehabilitate them to care adequately and economically for present traffic and restore the capital values which have been destroyed by undermaintenance? To what extent should rehabilitation be accomplished by repairs to existing plant and to what extent by replacement? Should not only existing traffic but a possibility of increased business be taken into account in restoring the carriers to a higher plane of upkeep and modernity?

Definite answers to these questions are beyond the scope of this introductory article, but it may be recalled that at the hearings on the proposed reductions in freight rates in May, Ralph Budd, president of the Chicago, Burlington & Quincy, estimated that an expenditure of $210,000,000 would be necessary to restore the Western lines alone to such condition that they could handle without further abnormal outlays the traffic of the "test period" before federal control, during which the railroads handled some 340 billion revenue ton-miles annually as compared with 447 billion in 1929. If it be assumed that an equal degree of deferred maintenance existed on the railways throughout the country and if this were attributed to them in the ratio of their gross revenues to those of the Western lines, then the estimate would total $570,000,000 for the country as a whole. This estimate, it is to be noted, is reached by the application of a very conservative formula and involves only the amount necessary to restore fixed property and equipment to such condition that maintenance expense thereafter would be normal.

For the attainment of a somewhat larger objective, that of the general physical rehabilitation of the railways, other articles in this issue set an estimate for necessary outlays on roadway and track at $700,000,000; on locomotive maintenance at $200,000,000; and on freight cars at $300,000,000; with similar estimates on other classes of property. If such sums, or any considerable proportion of them, should actually be spent without delay, it is evident that a great revival in the "capital goods" industries would follow.

Travel Speeds, Which Make Those of the Fastest Trains Look Slow by Comparison, Are the Steady Pace of Modern Transport Airplanes

Old Ways Are Not Good Enough

Traffic and transportation requirements are changing—New high standards of speed and efficiency are compelled by competition

NEW conditions demand new treatment. When new conditions develop, that which was good enough a few years ago proves far from satisfactory today. One hundred years ago new conditions left the stage coach in the ditch and over-ran with weeds the paths once worn smooth by the shoes of horses drawing well-filled canal boats. Today, new conditions have stopped the wheels of thousands of railroad cars and locomotives and have rusted once busy rails.

If there were no automobile, motor bus and airplane competition, the restoration of railroad passenger equipment to the old standard of speed, cleanliness and comfort might be enough. If there were no motor truck, pipe line and waterway competition, nothing more than a return to what used to be adequate in the way of freight service, freight equipment and freight train operation might suffice. In short, if the railroads still enjoyed the monopoly in transportation which once was theirs, rehabilitation of the railway transportation machine might be enough. But there is automobile, motor bus, motor truck, airplane, waterway and pipe line competition, and the railroads no longer possess the monopoly of the business of transportation. Because of this, simple rehabilitation of the railways is not enough. New facilities and new methods are essential if the railroads, for their own protection, are to meet the new traffic and transportation standards to which railway passengers and railway shippers have been introduced by railway competitors.

The Evils of Monopoly

The monopoly in transportation which they once enjoyed at most points left a mark which still is plain upon the organization, equipment and methods of the railways. Monopoly placed a premium upon economy, and minimized the necessity of ingenuity in meeting and anticipating the needs and wishes of shippers and travelers, especially those to whom only one railroad was available. Monopoly said, "Pull 100 cars!", not "Get that freight over the road!" Monopoly said, "Don't pamper passengers!", not "Make this journey one of the most enjoyable experiences of their lives!" Monopoly defined competition as what another railroad was doing at competitive points only, and made "meeting competition" the process of doing very little for patrons at non-competitive points, yielding to the unreasonable demands of big shippers, and doing everything with the greatest economy compatible with placating big shippers and competing centers of population.

Now, however, there is no monopoly. The railroads are hemmed in on all sides by competition of the most vigorous and resourceful, even if unfair, sort; and this competition is the most severe for the business of the small communities and customers that monopoly neglected. What has this competition done to the railways? In the 10 years from the beginning of 1923 to the end of 1932, the decade in which the railways lost their monopoly of transportation, revenue freight ton-miles declined from 412,727,000,000 to 234,320,000,000, while revenue passenger miles declined from 37,957,000,000 to 16,975,000,000. In terms of revenue, the decline on account of losses in freight traffic was from $4,622,000,000 to $2,451,000,000, while the loss in passenger business resulted in the reduction of revenue from $1,148,000,000 to $377,000,000.

Competition, as Well as the Depression, Has Reduced Railway Traffic

Much of the decline since the latter part of 1929 has been due, of course, to the depression in all business, but the expanding operations of railway competitors reduced railway traffic and earnings even during the years of great prosperity in the country's industries. Between 1923 and 1929, when general business and even railroad

freight business, were setting new records for volume, the competitive encroachment upon the passenger traffic of the railways caused a decline in railway passenger miles from 37,957,000,000 in 1923 to 31,074,000,000 in 1929, passenger revenues declining from $1,148,000,000 in 1923 to $874,000,000 in 1929. At the same time, when carload business was constantly growing, the l.c.l. freight traffic of the railroads—the first class of traffic to feel the effect of competition—was declining sharply. L.c.l. freight tonnage in 1923 was 44,329,000 tons, while in 1929 it was 36,043,000 tons, or 19 per cent less. Finally, although the general depression has somewhat obscured its effect, it is a fact that highway, waterway and airway competition has been much more severe since 1929 than it was before that year.

If rehabilitation of the railways is to mean rehabilitation of their earnings as well as of their physical properties, therefore, something must be done over and beyond that which is necessary to restore the railroads to the physical condition in which they were maintained before the depression. The standards of equipment and maintenance, the standards of operating methods, and the standards of traffic solicitation, which were then set up, were even then being proved inadequate to the task of meeting and overcoming the attacks of railway competitors. New high standards of speed, efficiency and convenience are compelled by the new traffic and transportation requirements.

What Is Required?

What do these new high standards require of the railways? To answer this question, it is necessary only to consider the features of the service offered to travelers and shippers by the competitors of the railways, and to draw from them conclusions as to what the railways must do to restore themselves to favor. It is unnecessary for the railroads to perform miracles in order to recover the position of public acceptance which once was theirs. It has been demonstrated time and again that, other things being equal, the traveling public and the shipping public will patronize the railways instead of a railway competitor, a condition for which the railways have reason to congratulate themselves. It remains, however, for the railways to make those "other things" equal.

With respect to passenger traffic, the principal competitors of the railways are the private automobile, the motor bus and the airplane. The private automobile attracts passengers because of its great convenience—it is ready whenever its owner wants to go—its considerable speed—over the highways now to be found in most parts of the country, average speeds of 40 miles an hour or more are easy—and its comfort. Passengers are attracted to the motor coach mainly by its economy. Much is made of the ability of the motor bus to take its passengers down the main streets and over scenic highways in "limousine" comfort, but the fact is well known to those who have experienced bus transportation that it is the fare of two cents or less per mile which fills the buses' none too generously spaced seats. The airplane, with fares only slightly higher than comparable railway and Pullman fares, and with adequate comfort to make short trips bearable, attracts its growing clientele by speed. Little wonder that the airplane is popular between New York and Chicago—at least on pleasant days—when it spans the distance in less than a third of the time required by the fastest trains.

Needed Service Improvements

This being the situation, what needs to be done by the railways to enable them to emerge victorious from the competitive battle with automobiles, buses and airplanes? To approximate closely the convenience of automobile travel, the railways need frequent schedules, not only between large centers of population but also between smaller communities. To match or approach the matching of the airplane's speed, the railways need to bring about a substantial acceleration of their passenger trains, an acceleration which, combined with the ability of the railways to make night travel comfortable, will offset that part of airplane speed which is beyond the reach of surface vehicles. To offset and to exceed the comfort of the automobile and—if you insist—of the motor bus, the railways need to equip their trains with cars representing the best that builders of cars and passenger car equipment have to offer, including air-conditioning, easier riding trucks, roller bearings, genuinely restful seats, attractive toilet and lounge furnishings, and so on. To keep pace with the economy of motor bus travel, the railways need to reduce their rates, perhaps to an extent greater than that already accomplished.

What are the considerations which have attracted freight away from the railways and to their competitors? Motor truck transportation offers complete service from

The Modern Motor Coach, Offering Extreme Economy in Travel, Has Helped to Destroy the Railways' Transportation Monopoly

storedoor to storedoor, fast service even over long distances, flexible and convenient service in ordinary times or in emergency, less rigorous packing requirements, low rates, and a simplified—if not too simplified—rate structure. The waterway, with advantages due to the paternal attitude of the government, offers low rates, the same being true of the pipe lines. Waterway competition may continue to flourish so long as the taxpayers are willing to pay a good part of its expenses, and pipe line and intercoastal steamship competition may be overcome only by the establishment of new types of freight rates, but truck competition demands a different sort of treatment. Here the competition is largely on a service basis, and will be overcome only when the railways meet service with service. Shippers want simplified transportation, high speed transportation, transportation capable of meeting emergencies and cheaper transportation. When shippers can move their freight by rail as quickly, as conveniently, as cheaply and as satisfactorily in every way as they can ship their freight by truck, freight will return to the rails and truck transportation such as exists today will have passed its zenith.

Likewise, modern locomotives, properly designed and equipped freight cars, modern signals and properly maintained track will permit the speed in the movement of trains over the road demanded by today's shipper. Freight containers and smaller freight cars will go far to eliminate irksome packing requirements, reduce loss in damage, and speed up the movement of freight by reducing the number of handlings necessary in the transportation of certain types of freight from the shipper to the consignee. Finally, motor trucks, operating in terminals as well as in light-traffic service along branch lines, will enable the railways to match the speed of truck transportation by reducing terminal delays and by completing the movement of railroad freight from the storedoor of the shipper to the storedoor of the receiver.

Deep Inroads in Railway Revenues Have Been Made by Motor Trucks and Automobiles, which Have Set New Standards for Flexibility and Convenience in Shipping and Traveling

Can the Railways Do the Job?

Is it possible for the railways to match the service of their competitors with as good or a better service of their own? Probably they cannot do so by the use merely of the equipment which they currently possess, although by new methods more might readily be done, it is believed, with facilities now in service. By the purchase of equipment now available, however, it is expected that the railways can not only match, but substantially surpass, many, if not all, features of the service of their competitors. Motor coaches and rail motor cars make possible a convenience in service reasonably close to that of the automobile and the motor bus. The cheapness with which such equipment can be operated renders the provision of the required frequency of service not too expensive, at the same time justifying the reduced rates necessary to meet the economy of bus transportation. Streamlined trains of the sort now under construction for the Union Pacific and the Burlington promise speed in railroad travel reasonably close to that of air transportation, while Furthermore, the economy which will result from the coordination of modern railway with modern highway service will justify the reduced freight charges which have already been found necessary by railways afflicted with the worst types of truck competition.

The Railways Can Determine Their Own Future

Making use of the better equipment now available to them, selling their service with all the resource and ingenuity at their command, the railways can rehabilitate their earnings while they rehabilitate themselves as the premier carriers of the nation's travelers and freight. The railroads will never regain the monopoly in transportation which they once possessed, but that is not essential. By meeting the new traffic and transportation requirements they can win back to themselves the traffic which rightfully should be theirs on the sole basis of quality and costs of service rendered. This is traffic which the railways need and which they cannot afford to be without. The salvation of the railways lies largely in their own hands. The traffic which they have lost and which they must recover will come back when the railways, by rehabilitating, improving and augmenting their facilities and their operating and sales methods, prove that they can handle it better than anyone else.

A Modern Freight Locomotive Which Is Expected to Pay for Itself in Less than Four Years

Motive Power Obsolescence High

More than half of the locomotives are over 20 years old—About 700 million miles of deferred maintenance

THE deferred maintenance of locomotives accumulated on the railways of the United States during approxmiately three and one-half years of business depression is sufficient to keep the locomotive maintenance forces occupied for at least ten months at the rate of operations prevailing during the month of July. With the restoration of material purchases to an amount sufficient to obviate the necessity of trading shop labor for materials, it would be necessary for the railroads to more than double the man-hours employed in July if they were actually to restore all deferred locomotive maintenance within the period of ten months and keep up with the current demands of locomotive service no greater than that performed in July.

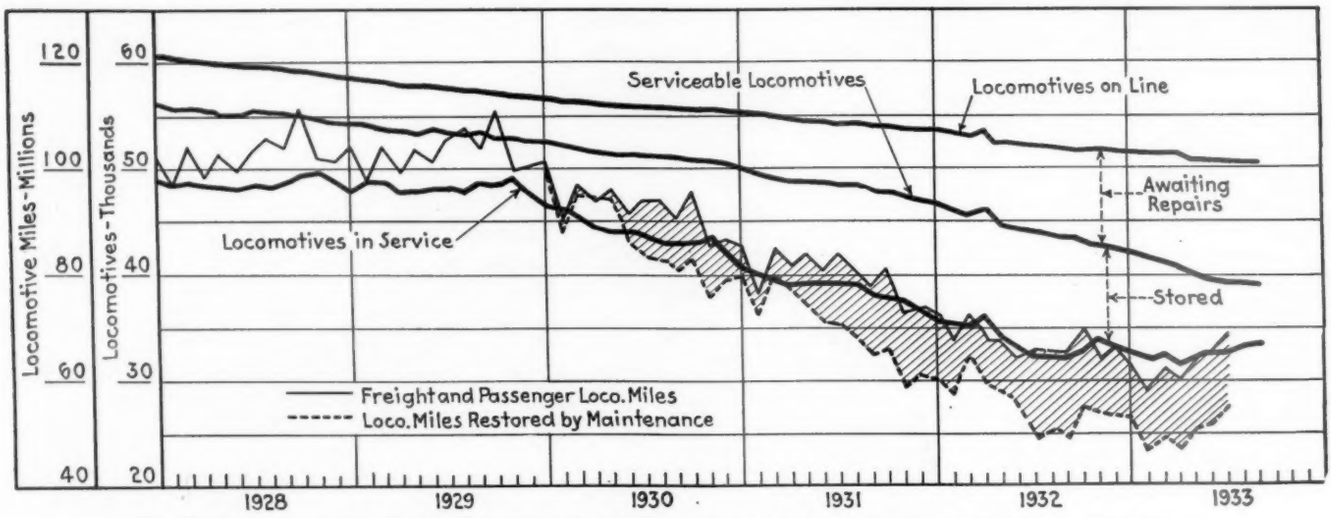
That the railroads have been able to maintain a reasonably reliable and satisfactory locomotive service with a steadily increasing proportion of run-out locomotive miles unrestored is due to the sharp, continuous traffic decline during 1930, 1931 and most of 1932. The tremendous accumulation of deferred locomotive maintenance, however, has created an extremely difficult situation for the railways to deal with when the volume of traffic resumes its upward trend. Some of the roads have already become acutely conscious of this fact as the results of last summer's experience. In the very acuteness of the problem, however, lies an opportunity.

Partly as a result of the depression itself, but more largely as the result of the sharp change in the rate of traffic growth which took place at the end of the war, the railroads are burdened with a large accumulation of obsolescence in their motive-power inventory. The necessity for expenditures on locomotive maintenance in excess of those demanded by any probable normal volume of business by upwards of $200,000,000 will necessitate a mushroom growth of shop forces which can scarcely be shaken down into efficient organizations before the need for the abnormal employment has begun to wane. A complete restoration of the deferred maintenance on the present inventory is, therefore, bound to be accompanied by inefficiency and waste. This can be saved and an impressive start made on reducing the present abnormal degree of obsolescence by capital expenditures to replace obsolete locomotives now in need of repairs.

Table I—Changes in the Locomotive Inventory Since 1920, Class I Railways

Year	Orders	Installed	Retired	Total Locos.	Aggregate tractive force (000,000)	Average tractive force
1920	1,627	1,017	1,254	64,746	2,341	36,365
1921	185	1,330	1,130	64,949	2,385	36,935
1922	2,311	1,226	1,682	64,512	2,401	37,441
1923	1,712	4,360	3,746	65,327	2,544	39,177
1924	1,186	2,787	2,529	65,358	2,593	39,891
1925	854	1,600	2,873	63,974	2,587	40,666
1926	1,083	1,882	3,105	62,761	2,611	41,886
1927	594	1,542	2,976	61,363	2,606	42,798
1928	467	1,017	3,047	59,470	2,580	43,838
1929	922	1,229	3,134	57,571	2,551	44,801
1930	355	1,160	2,204	56,582	2,527	45,225
1931	57	482	1,802	55,149	2,489	45,764
1932	3	477	2,316	53,316	2,430	46,299
	11,356	20,109	31,798			

From the beginning of the records of the Interstate Commerce Commission in 1889 to the end of the World War in 1918 the volume of revenue freight traffic on the railroads of the United States tended to double approximately every twelve years. Since that time freight traffic increased from a maximum of approximately 400 billion net ton-miles in 1918 to about 460 billion net



The Trend of Locomotive Conditions and the Cumulation of Deferred Maintenance Due to Reductions in Man-Hours

ton-miles in 1929. Had the rate of growth prevailing before the end of the war continued, the volume of traffic would have reached 800 billion ton-miles by 1931.

This sharp change in the rate of growth was accompanied by the beginning of a period during which attention was centered on intensive utilization of railway equipment. Together, these two influences have completely removed the old incentive for the purchase of new motive power; that is, the need for additional motive-power capacity to handle an increasing volume of business. Hence, there was a sharp decline in the trend of locomotive purchases following the orders placed in 1922 at the end of the post-war depression, and the volume of these orders themselves was adversely affected by the heavy program of rebuilding and modernization undertaken during the period of rehabilitation following the deferred maintenance which accumulated during the war.

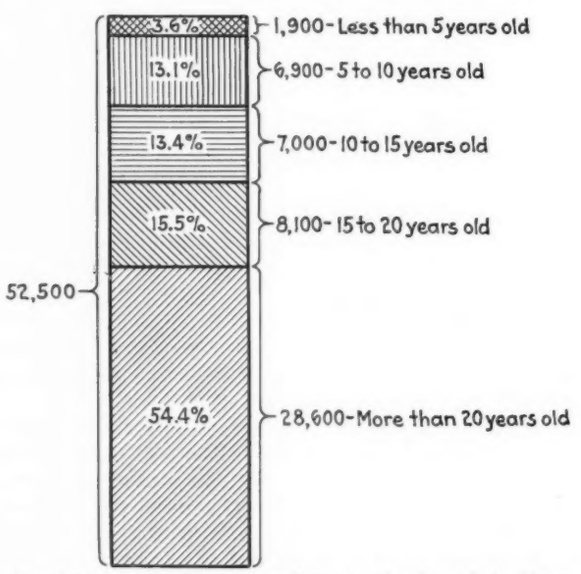
An indication of the extent of the modernization program during the years following the war is given in Table I which shows the number of locomotives ordered by Class I railways and the number of installations and retirements reported by the Interstate Commerce Commission during the same period. It will be noted that the locomotive orders aggregated about 11,300, whereas the number of installations reported is over 20,000. The difference of almost 9,000 represents installations balanced by retirements and must be accounted for in large measure by old locomotives rebuilt and partially modernized by the installation of betterments.

Many of these locomotives, however, have proved a distinct disappointment to those who sponsored the modernizing programs, partly because of the inability of the locomotives to stand up under the additional work expected of them and partly because of the

Table II—The Trend of Locomotive Service and Maintenance Since 1929

Year	Loco. repairs Acct. No. 308 (000)	Per cent of 1928-29	Machinists' and Boilermakers' hrs. Avg. per mo. (000)	Per cent of 1928-29	Stores materials used, per cent 1928-29 avg.	Frt. and pass. loco. miles—Avg. per mo. (000)	Per cent of 1928-29	Ratio M. and B. M. hrs. to frt. and pass. loco. miles	*Frt. and pass. loco. miles restored—Avg. per mo. (000)
1928-29 ...	$407,113	...	14,540	...	...	102,400	...	142.0	...
1930	345,389	84.0	12,362	84.8	98.9	92,700	90.5	133.1	87.7
1931	271,207	65.8	9,954	68.5	62.1	79,850	78.0	124.2	69.1
1932	192,225	46.7	7,835	53.8	36.3	67,230	65.6	116.2	55.1
1933	.....	...	7,139	49.2	...	63,260	61.7	113.0	50.2

* Based on machinists' and boilermakers' hours only.



Distribution of the Locomotive Inventory by Age of the Units

Table III—The Motive Power Reserve During 1933

	Locomotives in or awaiting shop	Locomotives stored serviceable
January 1	9,558	9,387
February 1	10,014	9,419
March 1	10,290	8,966
April 1	10,545	9,215
May 1	10,743	8,783
June 1	11,103	8,056
July 1	11,203	6,742
August 1	11,109	6,064
September 1	11,000	5,802

changes in locomotive proportions and improvements in design and materials which have been pushed forward rapidly during the past decade. As an indication of the removal of obsolescence from the locomotive inventory, therefore, the retirements, which aggregate almost 32,000 locomotives as reported, should be reduced to approximately 23,000 and the installations by a like amoun.t In other words, the number of locomotives ordered, which will closely approximate the number of new locomotives built over a period of years, is a better indication of the amount of new blood in the inventory than the reports of installations.

Old Age Is Creeping Upward

The age distribution of the present locomotive inventory is shown graphically in one of the charts. More than 28,000—about 54 per cent—of the 52,500 locomotives were 20 or more years old at the end of 1932. Less than 2,000 locomotives—not quite 4 per cent—had been added to the inventory during the past five years. Something of the significance of these figures may be obtained from the fact that if all locomotives less than 20 years old were on the active list—none stored and none in or awaiting shops—nearly 13,000 locomotives 20 years old and over were on the active list as of September 1 of this year. Assuming that some of the newer locomotives must be in or awaiting shops, it is probable that actually not less than 15,000 of the locomotives in active service at the present time come from this group ranging in age from 20 years upward.

Not all of these older locomotives are equally obsolete. The retention of some of them, partially modernized, for certain types of secondary service where the load factor is low because of intermittent duty, may be wholly justified. Too many of them are in service, however, even with the relatively light traffic prevailing at this time, and too many others are in storage, to be drawn upon as traffic increases, to indicate a healthy situation. It is, in fact, a situation which will have to be materially changed if the railroads are to be able to deal with a volume of traffic materially heavier than that now prevailing and still maintain the present degree of operating economy.

Deferred Maintenance

The greatest reality in life is life itself and it is not surprising that in corporate, just as in purely personal, affairs, self preservation takes precedence over all theories of economy, however logical they may be. If the accumulation of 700 million miles of deferred locomotive maintenance during the period of about three and one-half years has not been sound economy in the long view, it has aided materially in maintaining the integrity of a large number of railway corporations.

No exact basis is available on which to determine the volume of locomotive maintenance which has been deferred under the stress of the three past difficult years. Certain facts, however, furnish the basis for a reasonable approximation. In 1928 and 1929, during which years locomotive maintenance may be assumed to have been neither more nor less than that dictated by current demands, the ratio of machinists' and boilermakers' hours to freight- and passenger-locomotive miles was 142. This ratio declined steadily to 133.1 in 1930; 124.2 in 1931; 116.2 in 1932, and 113 during the first seven months of 1933. This decline is believed to be a fair measure of the extent to which labor in the shops and engine terminals has failed to keep abreast of locomotive miles run out, but it does not tell the whole story as to deferred maintenance. Material purchases declined at a much sharper rate. Corrected for declining prices and reductions in store stock, stores materials used in 1932 amounted to about 37 per cent of those used in 1929; labor hours to about 54 per cent, and locomotive service to about 65.5 per cent. This spread between the decline in labor hours and materials used reflects strikingly the practice of trading labor for material which has prevailed widely during this period.

Diesel Switchers Cut Yard Costs

Whatever may have been the instructions of managements in this matter, the men in the engine terminals and shops on whom the responsibility for keeping the railroads running ultimately rests, had no choice but to rob stored locomotives and those awaiting shopping when necessary parts were not available in the storehouse. There is, for instance, the case of the locomotive, white-leaded when turned out of the shop, which was found without driving wheels when ordered into service. Rods, motion work and specialties have been especially vulnerable. While no exact data are available as to the condition of locomotives reported stored serviceable or in or awaiting shops, there is reason to believe that many of them must have suffered severely from the raids of shop and enginehouse forces. This has probably been concentrated to a much greater degree on locomotives awaiting shops than on the stored power.

Because of such conditions it is impossible to arrive at a completely satisfactory estimate on the basis of

statistical indices. On the basis of the decline in man-hours and in materials used relative to locomotive miles run out, the 700 million locomotive miles of deferred maintenance is believed to be a reasonable approximation of the actual conditions.

It is this situation, so difficult to appraise accurately on a quantitative basis, which strongly suggests the wisdom of a rehabilitation policy based on capital expenditures, rather than maintenance expenditures, to take care of a large part of the temporary, excessive and disorganizing load on maintenance organizations and facilities involved in restoring these 700 million locomotive miles. Following the return of the railroads to private management by the United States Railroad Administration in the spring of 1920, the railroads embarked on a rehabilitation program in which the restoration of existing power by rebuilding and modernization was the predominant characteristic. Although the conditions at that time were no worse than those which now obtain, the railroads found it necessary not only to work their own shops to capacity, but also to contract for the facilities of many outside plants in order to restore their motive power to full serviceability in time to meet the up-turn of business following the depression and strike of 1921-22. The improvements in locomotive design which were brought out before many of these rehabilitation programs were completed left the railroads with a depreciated investment in partially modernized power which they could not afford to scrap.

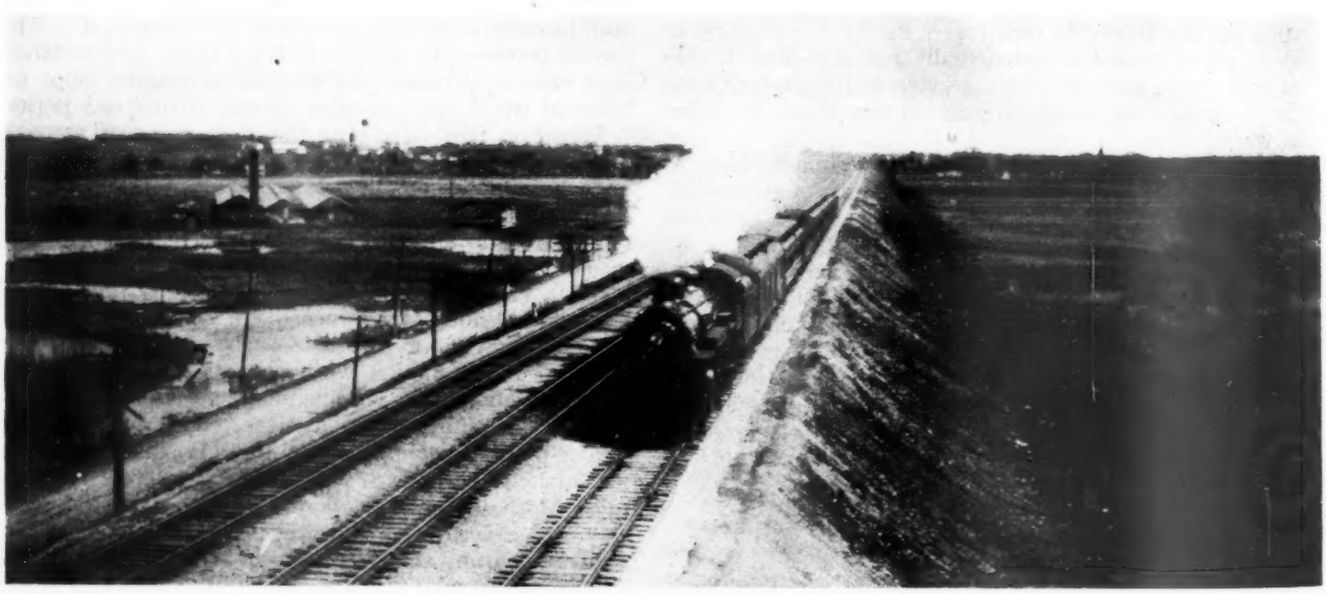
What Shall the Railways Buy?

The saving in immediate expenditures necessary for rehabilitation, plus the continued reduction in the cost of maintenance which could be effected by replacing much of the accumulation of old power now on hand, will go far to finance the purchase of new units without considering the operating economies which these units can effect in service.

Having a situation which provides an opportunity to inject some much needed new life into the motive-power inventory and at the same time to save a large sum in operating expenses which the railroads would otherwise be forced to make, the question arises now as it never has before—What shall we buy? To what extent will the steam locomotive continue to hold its supremacy in both passenger and freight service? Will it lose some of its present supremacy to some type of internal combustion motive power as it apparently already has in switching service? How extensive will the new lightweight streamlined articulated trains gradually replace steam passenger-train service?

In view of the uncertainties of the future which new developments are creating, will the railroads be justified in allowing the present motive-power situation to continue until these questions can be answered definitely? Such a course will scarcely seem to be sound economy and certainly would not be in the case of freight power. The demand here is still for heavy trains at high speeds for which a relatively small part of the freight locomotives in service today are suitable.

While the possibilities which the future holds must not be overlooked, a policy which is based on waiting to see what it may bring forth before making today's decision means that no decision is ever made. The fear that the economy to be obtained with the best facilities available today may be exceeded by tomorrow's developments has too many times prevented any economy being obtained at all. Ultimate perfection is never reached. The need for the economy and improved service which established types of motive power now available offer the railroads today is too great to be completely set aside awaiting a clearer vision of the future.



The "Overland Limited" of the Union Pacific

Sorting Scrap Largely Accumulated by Cutting Up Worn-Out and Ob solete Steel Freight Cars

Deferred Freight-Car Maintenance Exceeds $300,000,000

This amount represents unreplaced service mileage actually "run out" of equipment in the past 3½ years— Many stored cars are worn out or obsolete

FOR a number of years steam railways in this country have been largely "living on their fat," in so far as equipment maintenance, and particularly freight-car maintenance, is concerned. With a surplus of good-order cars in 1929, rapidly decreasing traffic and earnings, and consequently a keen urge for reduced expenditures, it was possible to curtail car maintenance by setting aside those cars needing heaviest repairs and using only those in relatively better condition. Running repairs also were kept at a minimum. Stored cars depreciated through exposure to the elements and by stripping them of serviceable parts. Many stored cars became obsolete, and comparatively few new ones were installed. As a result, the general physical condition of freight cars on American railways has been slowly but surely deteriorating and, if this trend continues even at present traffic levels, the number of freight cars available will not long be in excess of the requirements.

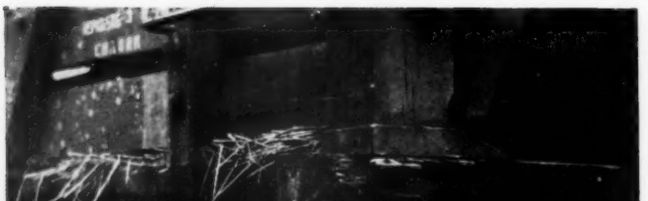
A striking picture of the present condition of freight cars as regards deferred maintenance and reduced traffic-carrying capacity is afforded by figures compiled by the Interstate Commerce Commission, Bureau of Statistics, and by the American Railway Association, Car Service Division. An analysis of these statistics shows that, based on service mileage actually "run out" of equipment, as compared with that restored through annual maintenance programs, freight equipment on Class I railways alone accumulated over $297,000,000 of deferred maintenance in the 3½ years ending July 1, 1933, and this estimate will be substantially in excess of $300,000,000, if cars owned by switching and terminal companies, not to mention private car companies, are taken into consideration. In this same period of 3½ years the proportion of bad-order cars increased from 5.4 per cent to 15.4 per cent: surplus cars in good order decreased almost 350,000 cars from the maximum; and the cars retired exceeded those installed by more than 180,000 units.

What Can Be Done About It?

What can and should be done with regard to this great accumulation of deferred maintenance and obsolescence in freight-car equipment? In the first place, to assure an effective transportation machine, steps should be taken to restore freight-car maintenance to former standards, at least to the extent of replacing service mileage actually run out. This work should be done to the fullest extent practicable with present somewhat increased earnings, possibly supplemented by funds borrowed, under liberal terms, from the government. While there are certain well-defined objections to the use of borrowed capital for maintenance purposes, these objections may be overweighed in this instance by the urgency of the need. In fact, the desirability of immediately initiating a substantially increased freight-car maintenance program is evident from a number of considerations. Material prices are apparently due to increase in the near future. The reconditioned equipment will be urgently needed if the

Table I—Comparison of Freight-Train Car Mileage and Car Maintenance Costs—Class I Steam Railroads

Year	Mileage freight-train cars	Per cent of 1925 miles	Cost of freight-car repairs	Per cent of 1925 cost	Cost of repairs per car-mile	
1925	26,832,767,587	100	$373,314,353	100	$.0139	Average five normal years—$.0123. *Deferred*
1926	28,602,714,426	107	377,702,544	101	.0132	
1927	28,395,641,802	106	340,695,795	92	.0120	
1928	28,972,991,656	108	325,278,852	87	.0111	
1929	29,744,751,567	111	338,079,151	91	.0114	
1930	26,334,688,274	98	262,884,111	70	.0099	$.0024
1931	22,223,280,450	83	187,609,247	50	.0084	.0039
1932	17,778,624,360	66	120,548,399	32	.0068	.0055



A Rotted End Sill

railways are to handle successfully even a relatively small increase in car loadings. The additional maintenance work will employ labor direct, and, through the extensive purchase of materials, have a stimulating effect upon general business and produce more traffic.

In addition to improving the maintenance standards of freight cars adapted to modern service requirements, new cars should be purchased to replace obsolete designs. It is reasonable to suppose that industrial recovery is certain and that car loadings will, in the not too distant future, again reach the 1925 and 1930 figures of 800,000 cars a week. This represents an increase of about 200,000 cars a week over present loadings. It requires approximately two cars from surplus to take care of one additional car loaded weekly. On this basis, a return to the 1930 level of traffic would require 400,000 cars in addition to those used at the present time. Doubtless 100,000 cars can be taken from the present surplus without reducing it below the danger point. But there is some question as to how far it would

Table II—Accumulation of Deferred Freight-Train car Repairs—Class I Carriers

Year	Total freight-train car-miles	Deferred repairs per car-mile	Total deferred car repair expenditures
1930	26,334,688,274	$0.24	$63,203,252
1931	22,223,280,450	.39	86,670,793
1932	17,778,624,360	.55	97,782,434
1933 estimated (6 mo.)			50,000,000
Deferred repairs for 3½ years.			$297,656,479

be necessary to draw upon the surplus to take care of increased loadings because of the apparent reduction in efficiency of utilization of the active cars now as compared with the years prior to the depression. If the condition of present equipment were restored to that prevailing before the depression, 200,000 cars could be secured by reducing the number of cars reported in bad order. It is questionable, however, whether the full restoration of the present bad-order equipment can be economically justified. The deterioration of cars which have been awaiting repairs for many months has been steadily progressing until their present value is insufficient to justify the excessive cost of complete rehabilitation. From 100,000 to 150,000 cars probably should be retired rather than rehabilitated. From 50,000 to 100,000 of these cars probably need to be replaced in order to protect the prospective increase in demand, with assurance of no shortages. It is also probable that the need for replacements is greater in the case of open-top than of box cars. Such a program extended over the next year or two will call for capital expenditures of from $100,000,000 to $200,000,000.

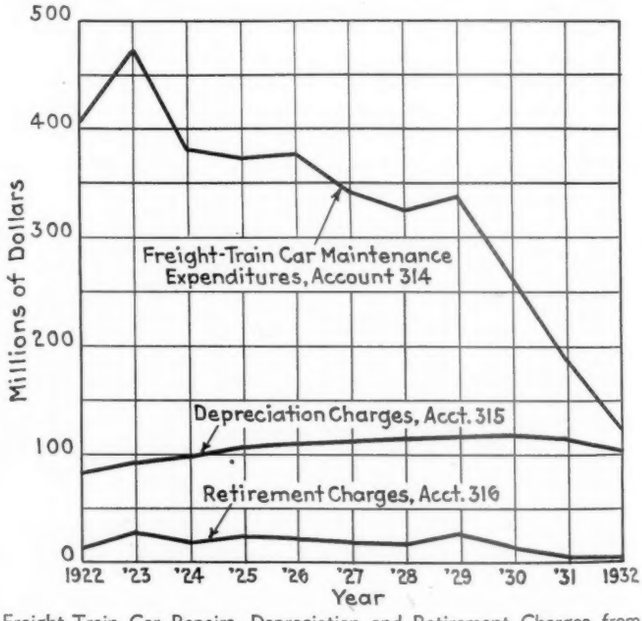
Now Is the Time To Build for Future Requirements

The statement has been made that a substantial part of all equipment and facilities, including freight cars, on American railways is now obsolete in relation to the most modern design and construction, and that a large replacement and development program will inevitably follow sustained business improvement. Thus, an unexampled opportunity is presented to introduce improved and perhaps radically changed equipment designs which promise to meet the service requirements of the future. Instead of planning capital expenditures hurriedly and haphazardly, all proposed improvements in general car designs, car details and construction methods can be examined critically in the light of the latest technical developments, service requirements and modern operating technique, and adopted if found sufficiently promising.

Table III—Trend of Freight-Train Car Ownership and Car Capacity—Class I Carriers

Year	Number	Per cent of 1925	Average tons capacity	Aggregate capacity in tons	Per cent of 1925
1925	2,357,221	100	44.8	105,569,670	100
1926	2,348,643	100	45.1	105,952,818	100
1927	2,324,799	99	45.5	105,845,568	100
1928	2,297,549	97	45.8	105,321,832	100
1929	2,277,464	97	46.3	105,410,586	100
1930	2,276,793	97	46.6	106,179,768	101
1931	2,201,407	93	47.0	103,421,700	99
1932	2,145,092	91	47.5	101,891,870	97
1933 (August)	2,087,085	89	48.0	100,180,080	95

The average capacity of freight cars has been steadily increasing for years, making it possible to handle more business with fewer cars year by year. On the other hand, particularly in recent years, there has been much pressure on account of truck competition and changes in commercial buying practices, to reduce car-load minimum weights. Undoubtedly, cars of smaller size and capacity will receive due consideration in any ex-



Freight-Train Car Repairs, Depreciation and Retirement Charges from 1922 to 1932, Inclusive, Class I Carriers

tensive car-building program. Their use will be justified in special service where the demand is sufficiently regular, but, with a scattered and irregular demand, idle car time and empty haul will have a tendency to offset other advantages. Moreover, the necessity of building such cars strong enough for interchange service with regular equipment implies relatively higher dead weight and cost than would otherwise be required.

Greater possibilities in stimulating and recapturing l.c.l. business would appear to exist in the extension of shipping-container and container-car service. In this field there is urgent need for a greater standardization of both containers and cars, increased flexibility of use, less weight for the same strength, standard anchorage design, suitable protection against switching shocks and provision for the transfer of containers directly to trucks without the use of overhead cranes. The question of first cost of the containers and special cars also has a vital bearing on the rates which must be charged and, therefore, on the extent to which this service can be expanded.

One feature of car design which seems positively assured for the future is the provision of lighter construction, consistent with strength requirements, because this low weight will facilitate rapid acceleration and braking, permit higher operating speeds and promote economy. This lighter weight can be obtained within reasonable price limitations by the judicious use of special alloy steels, aluminum alloys, welded construction, special cast and structural parts and light-weight specialties. Mechanical failures must be avoided, however, especially with loaded cars, and, in any consideration of light car design, a reasonable middle ground must be taken between light construction which is too weak and strong construction which is too heavy. The real solution of the problem lies in utilizing to the full modern materials and technique of construction which will provide substantially reduced weights without the sacrifice of essential strength.

Defective Car Siding

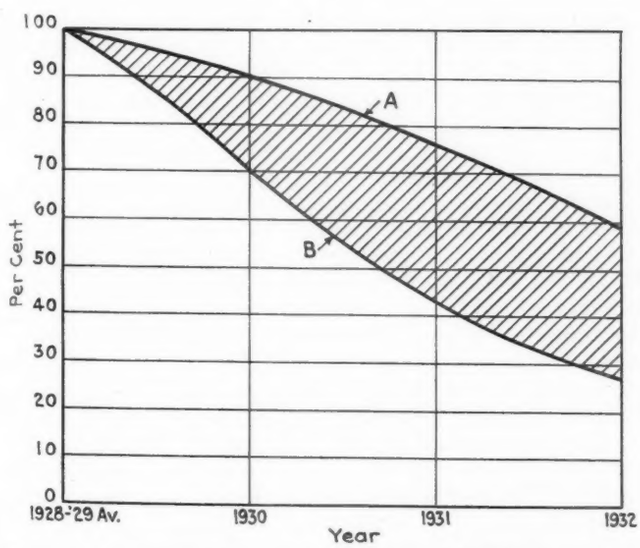
How the Estimate of Deferred Maintenance was Made

The maintenance of standards of freight-car condition necessary for handling traffic depends upon three important factors, namely, repairs necessitated by wear, time depreciation and obsolescence. The second and third factors continue regardless of car mileage, whereas the first is more or less directly proportional to car mileage. The present condition of freight equipment as regards deferred maintenance is clearly brought out in a chart and also in Table I, which sets up a comparison of the freight-train car mileage and car maintenance expenditures by years from 1925 to 1932, inclusive. A striking statistical comparison is afforded by the fact that car-miles decreased only 34 per cent from 1925 to 1932, whereas the expenditures for maintenance in this same period decreased 68 per cent. Considering that expenditures for maintenance were normal during the years 1925 to 1929, inclusive, the average cost of repairs during this period was 1.23 cents a car-mile. This cost decreased to .99 cents a car-mile in 1930; .84 cents in 1931; and .68 cents in 1932. Disregarding, for the moment, any changes in labor prices, material prices, or working conditions, it may be considered that any reduction in freight-car repairs below 1.23 cents a car-mile is secured at the expense of the physical condition of freight equipment and may be classified as deferred repairs, amounting, as shown in the table, to .24 cents a car-mile in 1930; .39 cents in 1931, and .55 cents in 1932.

These deferred unit repair costs are converted into dollars, as shown in Table II, which indicates that it will require a minimum expenditure of $297,000,000

Table IV—Freight-Car Repair Conditions as Compared with Car Loadings and Car Surplus

Month of January	Average weekly car loadings	Average number of surplus cars	Cars in need of minor repairs	Per cent of cars on line	Cars in need of heavy repairs	Per cent of cars on line	Total bad-order cars	Per cent of cars on line
1929	892,864	347,159					134,691	6.0
1930	867,699	442,401	33,188	1.5	85,617	3.9	118,861	5.4
1931	718,303	666,781	37,105	1.7	110,229	4.9	145,312	6.6
1932	567,469	741,395	46,333	2.2	141,333	6.5	187,666	8.7
1933	477,624	689,249	70,823	3.3	195,243	9.3	266,066	12.6
September, 1933	635,681	398,451	74,858	3.7	229,344	11.2	316,437	15.4



Comparative Percentage Decrease, Based on 1928-1929 Average, in (A) Freight-Train Car Miles and (B) Railway Expenditures for Air-Brake Repair Parts and Factory Repairs to Air-Brake Equipment

to restore the mileage actually run out of equipment in the last 3½ years, to say nothing of building up service life to meet the anticipated increase in traffic requirements. The argument may be advanced that this estimate, based on prices prevailing during 1925 to 1929, should be reduced on account of the general decrease of about 15 per cent in present material prices and 10 per cent in the wage level. The pressure for economy also has taught maintenance forces how to cut corners and save expense to an extent which would have been considered impossible only a few years ago. There are certain offsetting factors, however, in all of these tendencies to reduce costs. Some of the corners cut have been temporary expedients which will actually increase the cost in the long run. Stores expense, on most roads, has been substantially increased and the higher cost of handling materials more or less offsets the decrease in price. As regards labor, the uncertainty regarding employment probably decreases more than it increases efficiency and will go far towards offsetting the slightly lower wages paid. Decreased efficiency is also brought about by constant interruptions of work and comparatively long intervals of idleness due to the small number of hours worked each week or month. Considering all of these factors, the estimate of $297,000,000 of deferred maintenance may be considered conservative.

Table V—Number of Freight-Train Cars Installed and Retired

Year	Installed		Retired	
1925	139,083		128,573	
1926	93,369		103,152	
1927	73,254		96,991	
1928	62,945		90,707	
1929	94,946		115,869	
1930	81,038		82,101	
1931	14,910	104,965	82,828	288,268
1932	5,869		62,184	
1933 (7 mo.)	3,148		61,155	

The trend in car ownership, unit size and aggregate capacity is shown by years from 1925 to date, in Table III. While the number of cars decreased to 89 per cent, the average capacity increased from 44.8 to 48.0 tons per car, so that the aggregate capacity decreased only to 95 per cent from 1925 to August, 1933. The growing encroachment on the physical condition of freight cars is disclosed in Table IV, which shows that, during the past 3½ years, freight cars in need of light repairs increased over 40,000; cars in need of heavy repairs increased about 150,000; and total bad-order cars increased approximately 200,000. This means that surplus cars in good order have been reduced by about 200,000 on account of deferred repairs, a fact borne out by surplus car statistics, as compiled by the Car Service Division and shown in one column of Table IV.

Table VI—Chilled-Iron Wheels Placed in Freight-Car Service

Year	Source of Supply: Wheel manufacturers	Per cent of 1925	Railroad-owned foundries	Per cent of 1925	Total	Per cent of 1925	Car-miles for each wheel removed
1925	2,620,764	100	259,196	100	2,879,960	100	7,930
1926	2,547,484	97	235,278	91	2,782,762	97	8,740
1927	2,434,171	93	237,688	91	2,671,859	93	9,020
1928	2,183,402	84	182,813	70	2,366,215	82	10,400
1929	2,408,908	92	209,654	80	2,618,562	91	9,660
1930	1,952,871	75	189,373	73	2,142,244	74	10,400
1931	1,266,144	48	159,206	61	1,425,351	49	13,200
1932	911,201	35	166,520	64	1,077,721	37	14,050
1933 (7 mo.)	429,202		83,260	(est.)	512,462		

New equipment installations have an important bearing on average available service life, and a comparison of cars installed and retired from 1925 to August, 1933, is afforded in Table V. During the years 1925 to 1930, the number of cars installed balanced fairly well with those retired, but, during 1930 and up to August, 1933, approximately 180,000 more cars were retired than installed. This gives a particularly significant picture of conditions, since the retired cars also decreased in number from 115,000 in 1929 to 61,155 in the first seven months of 1933. The reason for the small number of cars retired, obviously, was the inability of the railways to absorb into the operating accounts the difference between the book value of the equipment and the accrued depreciation charges. As shown in one of the charts, while freight-car maintenance was dropping from $338,000,000 in 1929 to $120,000,000 in 1932, depreciation charges were accumulated at a fairly constant rate of somewhat over $100,000,000 a year, but retirements decreased from $26,723,419 to a minimum of $4,629,186.

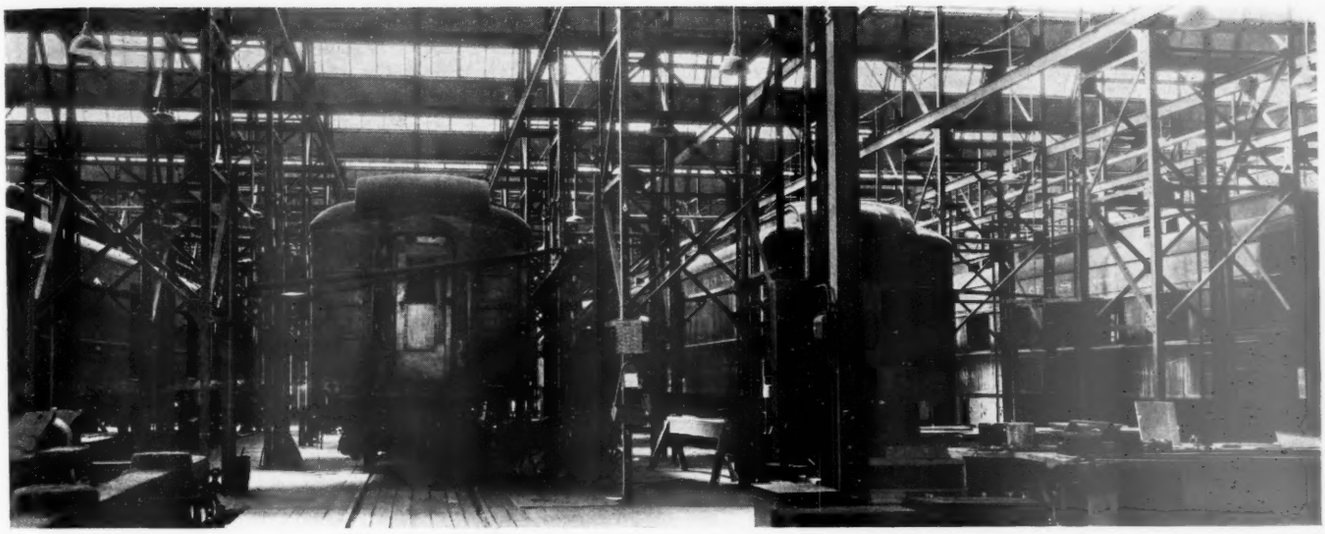
Other Indications of Deferred Maintenance

The greatly reduced purchases of practically all kinds of car-repair materials also afford a striking illustration of the extent of deferred maintenance. For example, the shipments of new chilled-iron wheels during the period under discussion, as shown in Table VI, may be considered. The wheels furnished by the manufacturers dropped 65 per cent from 1925 to 1932, while railroad-owned wheel foundries were cutting their production only 36 per cent. The total number of wheels placed in service during this period, however, dropped 63 per cent. A rough approximation of the annual requirements can be estimated from the average 1925 to 1929 performance, which amounts to one wheel for each 10,000 car miles. On this basis, the number of wheels worn out by the car mileage developed during the 3½ years ending July 1, 1933, was 6,394,150. The number of second-hand wheels suitable for further service, obtained from dismantled cars, is estimated to be 1,383,866, which accounts for an estimated decrease of 1,236,372 in new-wheel purchases.

The actual figures for steel wheels and axles furnished the railroads since 1929 are not a matter of public record, but the available partial information indicates that the dropping off of purchases of these materials is equally as great, if not greater, than in the case of chilled-iron wheels, and what is true of wheels and axles, will apply generally to all materials required for car maintenance. For example, the purchases of brake shoes, based on the 1925 to 1929 average consumption, dropped to 95 per cent in 1930, 77 per cent in 1931 and 60 per cent in 1932. In the same period, the purchase of spare parts and factory repairs of air-brake material dropped to 70 per cent in 1930, to 43 per cent in 1931 and 27 per cent in 1932. These latter figures are shown graphically in a separate chart. The area between the curves in this chart affords a measure of the apparent deferred maintenance as regards brake equipment.

It is costly to defer certain kinds of maintenance work because deterioration progresses more rapidly with neglect. The most striking single example of this fact is in connection with the painting of equipment. While no general figures are available regarding the decreased consumption of paint materials in freight-car maintenance, there can be no doubt that lack of adequate paint protection is exacting a tremendous toll in freight-car corrosion, general depreciation and reduced service life.

The statistics of freight-car service and car-repair expenditures, as well as the numerous specific illustrations cited, constitute unmistakable evidence that action must be taken, and taken soon, to change the trend of car maintenance, retirements and new installations, in order to replace mileage run out, restore the surplus of cars and fit equipment to meet future needs.



Modern-Equipped Shop for Reconditioning Passenger Cars

Passenger Equipment Maintenance Drastically Cut

An expenditure of at least $70,000,000 needed to restore service mileage run out in the last 3½ years—New equipment trends

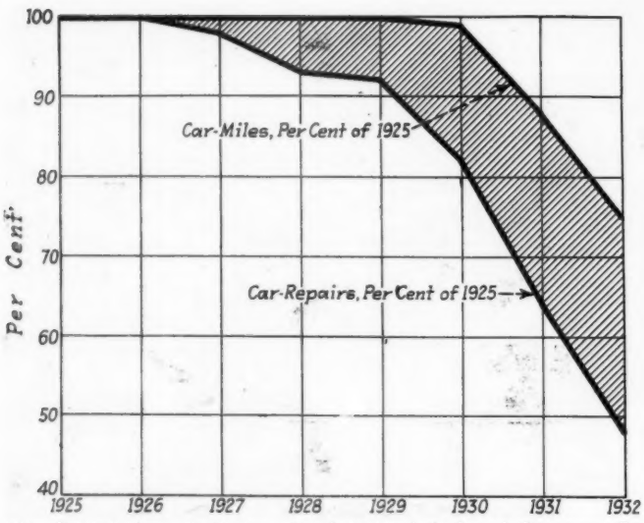
EQUIPMENT maintenance is "deferred" when the service mileage run out per year exceeds that restored by annual repair programs, and, on this basis, the deferred maintenance of passenger-train and motor-train cars on Class I carriers in the United States exceeded $70,000,000 in the 3½ years ending July 1, 1933. Moreover, the cars retired, while only about 50 per cent of normal, exceeded those installed in this same period by over 2,700 units. It is true that even more passenger traffic than was offered could have been handled safely, in spite of the drastic curtailment of passenger-car maintenance, but, from the point of view of passenger appeal, the present general trend in equipment conditions cannot be long continued if the railways are to hold what traffic they have, to say nothing of recapturing traffic from competitive agencies and stimulating new business.

The maintenance of passenger cars has declined along much the same lines as that of freight cars, but it is impossible to make passenger-car-miles follow the decline in travel as closely as freight-car-miles follow the decline in tonnage. Consequently, statistics of passenger-car-miles do not give an entirely accurate measure of the use of equipment. Another fact to be remembered in any consideration of this subject is that the combined effects of time and the elements on car exteriors, and of service on the interior appointments and finish of the cars, are the cause of nearly two-thirds of the total maintenance cost. Since the need for maintenance from these causes does not unfit the equipment for safe road operation, it is possible to make large reductions in current expenditures for passenger-car repairs without much relation to the extent of the service being rendered. The invariable effects of this policy, however, are a certain amount of cumulative deferred maintenance in car parts subject to corrosion if un-

Table I—Statistics of Passenger-Train Car Miles and Maintenance Expense Accounts for Class I Carriers, 1922 to 1932, Incl.

Year	Total car-miles* (thousands)	Passenger-Train Cars			Motor Equipment of Cars			Total Repairs Accts. 317 + 320
		Repairs Acct. 317	Depreciation Acct. 318	Retirements Acct. 319	Repairs Acct. 320	Depreciation Acct. 321	Retirements Acct. 322	
1922	3,414,345	78,259,400	12,123,738	422,421	1,553,911	477,810	8,536	79,813,311
1923	3,585,263	91,550,882	12,661,693	951,381	1,846,513	458,950	14,188	93,397,395
1924	3,646,363	85,972,479	14,105,678	845,978	1,932,513	521,190	12,889	87,904,992
1925	3,746,427	83,835,320	15,344,577	1,626,895	2,018,353	584,033	25,323	85,853,673
1926	3,836,788	85,286,429	16,373,460	1,353,505	2,643,923	724,047	21,175	87,930,352
1927	3,830,557	81,219,354	18,178,446	1,603,544	3,087,229	1,064,674	45,556	84,306,583
1928	3,798,733	76,208,287	19,112,346	1,997,609	3,569,464	1,321,675	59,583	79,777,751
1929	3,904,500	75,253,355	20,303,347	1,563,746	4,158,401	1,579,804	102,095	79,411,756
1930	3,725,500	66,388,489	20,699,800	899,243	4,354,423	1,774,260	99,813	70,742,912
1931	3,317,107	50,707,957	20,577,067	234,440	4,174,459	2,063,897	23,330	54,882,416
1932	2,799,240	37,140,936	19,433,572	741,968	3,683,885	2,098,615	11,897	40,824,821

* Including motor-car-train car-miles.



The Shaded Area Indicates the Extent of Deferred Passenger-Car Maintenance, Based on 1925

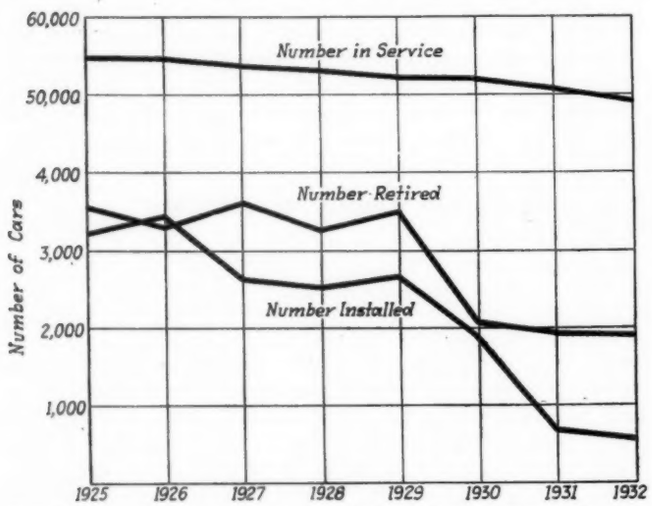
protected, and an increasing shabbiness of appearance which may not affect the safety of car operation, but which, to some extent at least, is bound to have a deterrent effect upon railway passenger travel.

The Downward Trend in Car-Miles and Car Repairs

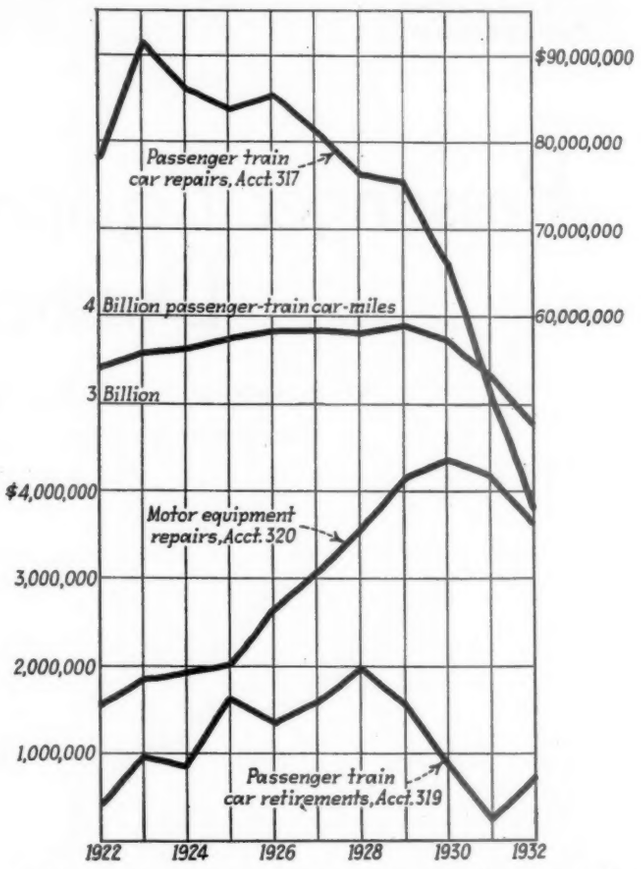
The present large amount of deferred maintenance in passenger cars is reflected in the tables and charts accompanying this article. For example, the statistics of passenger-train car-miles and repair costs for Class I carriers are given in Table I, which shows the individual accounts for repairs, depreciation and retirements separately and for both passenger-train cars and the motor equipment of passenger-train cars. In the case of passenger-train cars, while the repair costs for labor and material, Acct. 317, were cut heavily, particularly in 1930, 1931 and 1932, it will be observed that the depreciation charges, Acct. 318, were maintained fairly uniform, but the retirement charges, Acct. 319, also were drastically reduced, especially in 1930 and 1931 and increased slightly in 1932. Motor-equipment repairs, Acct. 320, increased rapidly from 1922 to 1929 and 1930, because of the substantially increased amount of this equipment placed in service, then dropping in accordance with the general trend of maintenance expenditures. The depreciation charges for motor equipment, Acct. 321, also increased with the larger number of power rail cars in service, but the retirement charges, Acct. 322, after reaching a peak of over $100,000 in 1929, were almost wiped out by 1932. The relative increase of motor-equipment repairs, while passenger-train car repairs were decreasing, is also shown graphically in one of the charts.

Table II—Comparative Reductions in Passenger-Train and Motor-Car-Train Car Mileage and Repairs, Class I Carriers

Year	Pass.-train car-miles (thousands)	Per cent of 1925 miles	Pass.-train car repairs	Per cent of 1925 repairs	Repair cost per car-mile (cents)	Deferred repair cost per mile, based on 1925 (cents)
1925.....	3,746,427	100	$85,853,673	100	2.3	0
1926.....	3,836,788	102	87,930,352	102	2.3	0
1927.....	3,830,557	102	84,306,583	98	2.2	0.1
1928.....	3,798,733	101	79,777,751	93	2.1	0.2
1929.....	3,904,560	104	79,411,756	92	2.0	0.3
1930.....	3,725,560	99	70,742,912	82	1.9	0.4
1931.....	3,317,107	88	54,882,416	64	1.7	0.6
1932.....	2,799,240	75	40,824,821	48	1.5	0.8



Passenger-Train Cars in Service, Installed and Retired, Class I Carriers, 1925 to 1932, Inclusive



Graphical Representation of Passenger-Train Car-Miles, Repair Costs and Retirement Charges, Class I Carriers, 1922 to 1933, Incl.

To indicate more clearly the relatively greater decline in expenditures for maintainance as compared with passenger-train car-miles, the respective figures have been set up separately in Table II and the reductions shown in per cent of 1925. It will be noted that the passenger-train car-miles, including motor train-car miles, decreased 25 per cent from 1925 to 1932, the expenditures for maintenance of this equipment dropping 52 per cent during the same period. The trend of unit repair costs, also given in Table II, shows a decrease from 2.3 cents per car-mile in 1925 to 1.5 cents per car-mile in 1932, the difference between the cost for each year and the 1925 cost being shown as deferred unit repair costs in the last column of the table. These deferred unit repair costs, when multiplied by the respective car-miles for 1930, 1931 and 1932, as shown in

Table III, and supplemented by an estimate for the first six months of 1933, indicate an accumulation of deferred maintenance of $70,198,802 in the 3½ years ending July 1, 1933.

The estimate quoted is based on labor and material prices as of 1925, and may be reduced, if desired, to take account of present somewhat reduced prices. There are a number of factors, however, such as increased stores expense for handling material, loss of efficiency due to long and sustained interruptions of work, and

Table III—Accumulation of Deferred Passenger-Train and Motor-Car-Train Car Repairs for 3½-Year Period, Class I Carriers

Year	Total car miles (thousands)	Deferred repairs per car mile	Total deferred car repair expenditures
1930	3,725,560	.4 cents	$14,902,240
1931	3,317,107	.6 cents	19,902,642
1932	2,799,240	.8 cents	22,393,920
1933 (est. 6 mo.)			13,000,000
			$70,198,802

cumulative deferred maintenance due to time and weather depreciation which are not considered in this estimate, and which will go far to offset any differences between present prices for labor and material and those current in 1925. On the whole, it is conservative to estimate the deferred maintenance of passenger train cars, for the period mentioned in excess of $70,000,000.

The trends of passenger-car installations and retirements, also equipment in service on Class I roads, are shown in Table IV and in one of the charts, the number of cars installed dropping about 72 per cent from 1925 to 1932, while retirements dropped only 46 per cent. In other words, the deficiency in equipment caused by the retirement of worn-out and obsolete cars was far from being made up by the installation of new or rebuilt cars. New passenger cars ordered from the car builders during this period for service in the United States dropped from 2,303 in 1929 to 667 in 1930, 11 in 1931, and 39 in 1932. Similarly, orders for rail-motor cars and trailers were reduced in number from 132 in 1929 to 54 in 1930, 26 in 1931 and 15 in 1932.

The statistics of Pullman car mileage and maintenance expenditures, as reported to the Interstate Commerce Commission for the years 1925 to 1932, inclusive, are given in Table V. It will be noted that, as compared to 1925, car-miles where higher each year up to and including 1930, there being a considerable drop to 1.25 billion car-miles in 1931 and an even greater decrease to .8 billion car-miles in 1932. This latter figure represents 76.6 per cent of the 1925 mileage. Maintenance expenditures, in the meantime, excluding depreciation, dropped only slightly below those of 1925 each year up to 1930. In 1931, and especially 1932, the heaviest reductions were made, totalling 52 per cent in the latter year, as compared with 1925. These percentage reductions correspond rather closely with similar figures for railroad-owned equipment, the principal difference being that, while the number of railroad-owned passenger cars in service decreased 10 per cent from 1925 to 1931, the number of Pullman cars operated during the same period was reduced from 8,238 to 5,692, or 31 per cent. By concentrating repair expenditures on fewer cars, a relatively higher standard of car condition was assured and less deferred maintenance permitted to accumulate, in the case of Pullman equipment.

Table IV—Passenger-Train Equipment in Service, Installed and Retired, Class I Carriers

Year	Cars in service	Cars installed	Cars retired	Net inc. or dec.
1925	54,622	3,230	3,569	–339
1926	54,773	3,455	3,309	146
1927	53,822	2,640	3,612	–966
1928	53,097	2,524	3,252	–728
1929	52,259	2,663	3,499	–836
1930	52,130	1,899	2,036	–137
1931	50,747	697	1,938	–1,241
1932	49,250	579	1,928	–1,349

What of the Future?

The future policy of the railways with regard both to the making up of deferred passenger-car maintenance and the installation of new equipment must, in the last analysis, rest upon the trend of traffic and earnings. Granting that much short-distance travel, except commutation travel, is perhaps irretrievably lost, and that long-distance tourist travel is, for the present, a luxury largely dispensed with, the railways have the control of future passenger traffic trends more largely within their own hands than is commonly appreciated. For example, they can more or less control all of the following factors which, generally speaking, influence passenger travel: Safety, cost, speed, convenience of service, comfort and aesthetic appeal of the equipment. Sometimes speed is of primary importance. More often, especially under present conditions, low cost is the deciding factor, being placed above every other consideration, including safety. How can the railways best capitalize the natural advantages of transportation by rail and provide a type of equipment and service best adapted to meet the demands and, in certain cases, the conflicting requirements of modern passenger traffic?

Table V—Statistics of Pullman Car Mileage and Maintenance Expenditures, 1925 to 1932, Incl.

Year	Car-miles (thousands)	Per cent of 1925	Total maintenance* (thousands)	Per cent of 1925	Car repairs (thousands)	Per cent of 1925
1925	1,043,663	100.0	$28,365	100.0	$19,058	100.0
1926	1,112,967	106.6	30,215	106.5	19,850	104.2
1927	1,140,476	109.3	28,434	100.2	17,579	92.2
1928	1,153,890	110.6	28,738	101.3	17,889	93.9
1929	1,206,767	115.6	30,159	106.3	18,939	99.4
1930	1,183,669	113.4	30,290	106.8	18,659	97.9
1931	1,025,165	98.2	26,663	94.0	15,401	80.8
1932	799,485	76.6	20,432	72.0	9,904	52.0

* Includes depreciation, etc.

From the point of view of safety, the railways already have a big lead on their competitors, and it is only necessary to retain this lead by scrupulous care in maintaining all safeguards in the operation of present equipment and in the design and operation of any new types which may be considered.

In the comparatively few instances in which extremely high speeds are all important, it is improbable that any land vehicle can ever meet the competition of the airplane. For moderately high speeds, however, the railways have a natural potential advantage over highway transport, which should be developed to the practicable limit by provision for still further increases in operating speeds, reduction of delays and tightening up of schedules.

In this connection, the light-weight streamlined individual power rail cars and articulated motor trains hold much of promise. Two of these high-speed trains, now under construction for the Union Pacific and the Chicago, Burlington & Quincy, are designed for top speeds of about 110 m.p.h, a running speed of 90 m.p.h. on straight, level track, and an average speed of over 60 m.p.h., including stops. In the construction of these

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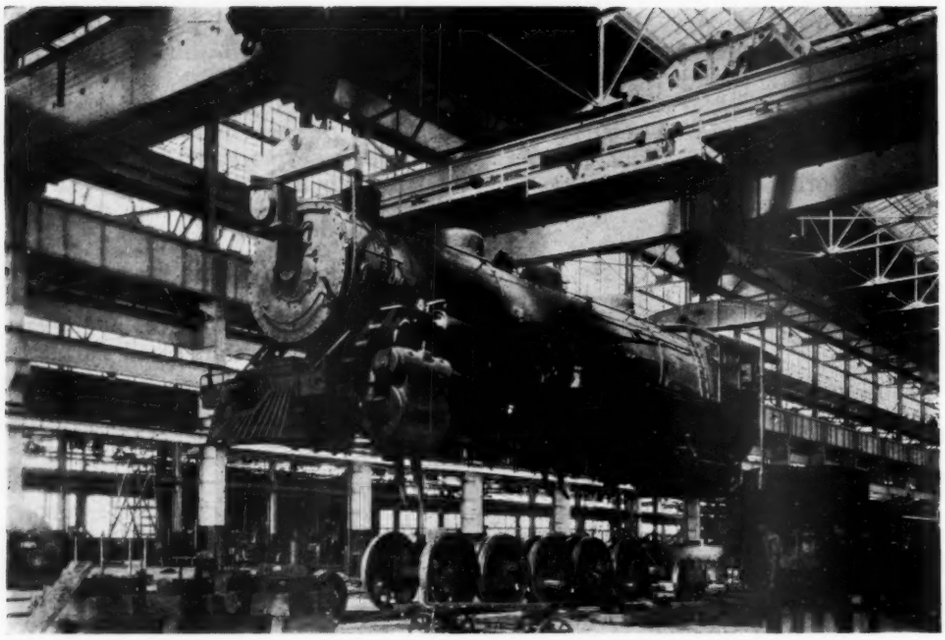


The Concentration of Heavy Repair Work at Modernized Central Shops Will Assure the Reduction of Unit Locomotive Repair Costs

Can Equipment Maintenance Costs Be Reduced?

Longer locomotive runs and declining traffic have changed maintenance problem—Thorough analyses of present methods will show way to future economies

BETWEEN 1918 and 1922 two changes took place in the railroad industry which have had a far-reaching influence on the problem of equipment maintenance. Railroad traffic, for the first time, began to show indications that it would no longer double in volume once each 12 years, as it had in the past, and experiments were inaugurated in the practice of longer locomotive runs. The first of these two changes marked the beginning of the end of the period of expansion of repair facilities and ushered in a period of more intensive utilization of those facilities. The second of the two changes—longer locomotive runs—has led to the consolidation of many shops and engine terminals during the past 10 years and is now pointing the way to the possibilities of further economies.

In 1929 the three major items of equipment maintenance expense—locomotive, freight car and passenger car repairs—involved an outlay of over 800 million dollars. Locomotive repairs alone accounted for approximately half of this expenditure. Between 1921 and 1929 the cost of repairs per locomotive-mile for the Class I roads decreased about 17 per cent while the cost of freight locomotive repairs per thousand gross ton-miles decreased almost 36 per cent. Immediately the question arises as to whether this decrease was due to better repair facilities or to a great increase in the hauling capacity of locomotives. Unfortunately there are no accurate statistics to indicate to what extent better repair facilities played a major part in this improvement, but it is significant that in 1929 as compared with 1921 the railroads produced 50 per cent more gross ton-miles with an increase of only 16 per cent in freight locomotive mileage and in the same period locomotive repair costs dropped only 9 per cent. It seems reasonable, then, to assume that while repair facilities kept pace with traffic demands the decrease in repair costs per 1,000 gross ton-miles was due principally to the greater hauling capacity of the modern locomotive. Freight car repair costs between 1921 and 1929 decreased 27 per cent while freight car-miles increased 45 per cent.

In any consideration of the possibilities of reducing maintenance of equipment costs, it is necessary to recognize that such costs are affected (1) by locomotive and car design, (2) by locomotive and train operation, and (3) the adequacy and efficiency of repair facilities. This article will discuss only the last of these three factors and, because of limited space, will deal in greater detail with locomotive repairs than with car repairs.

The inauguration of longer locomotive runs not only proved to mechanical and operating officers that a locomotive was capable of rendering far greater service than they had previously considered possible but that in order to obtain this service a higher standard of maintenance was required. This in itself was responsible for many changes that have been taking place in shop and enginehouse practice. One of the most important of these changes has been the specialization of repair

work. In the back shop the work was segregated into separate departments and the proper functioning of these departments was co-ordinated by the development of shop scheduling or production control systems. Thus the railroad shop, taking a lesson from other industries, set up, through necessity, a means of providing more accurate detailed knowledge of its own operations. Immediately it began to visualize shop capacity not in terms of the output of the shop as a whole but in terms of the production possibilities of individual departments. The development of the scheduling idea in connection with specialized repairs has produced facts upon which the progress of the last few years has been based. The future is going to demand a still more detailed knowledge of shop operations in order to discover the opportunities for economies.

The trend toward the concentration of repair work at centrally located shops has increased the opportunity for more accurate control of costs. The mechanical officer who, a few years back, was obliged to co-ordinate the work of many repair points scattered over outlying districts should now be able to concentrate upon the problem of raising the remaining shops and terminals to their maximum efficiency. Opportunities for savings that once represented a small factor in a large problem have now become a larger factor in a smaller problem.

No Plan Can Be Made without Facts

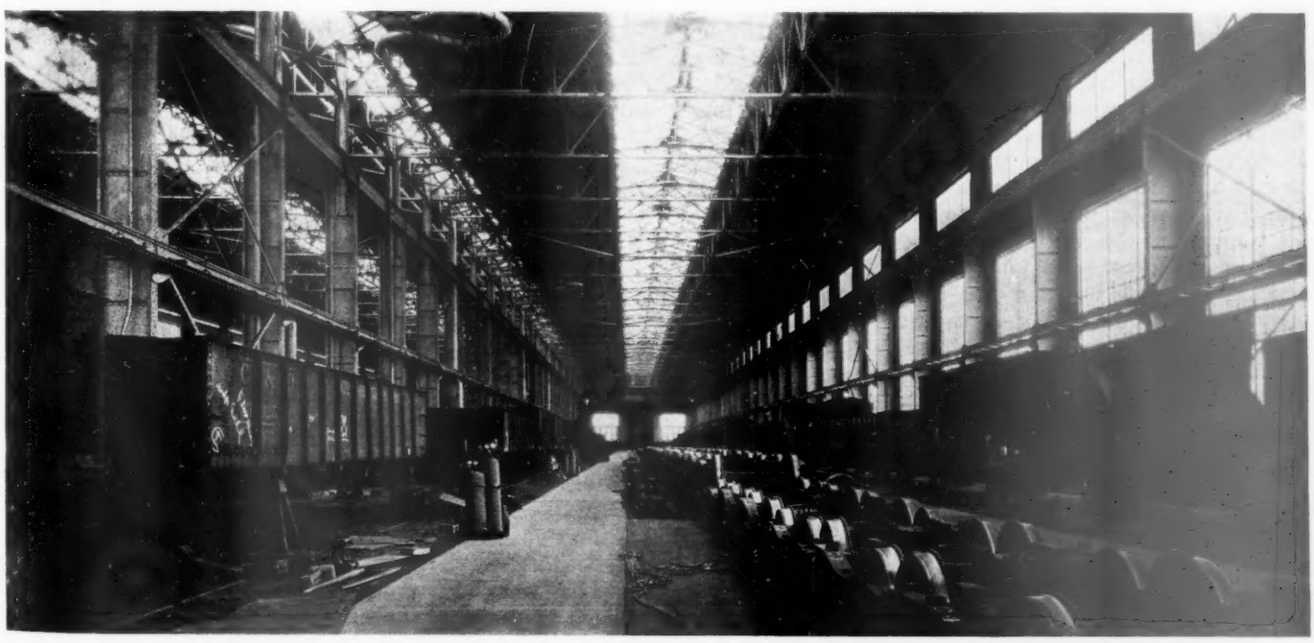
No program can be planned nor can a problem be solved without facts. It is surprising that there is so little accurate information concerning the maintenance of equipment problem.

Before any attempt can be made to determine where savings can be made in shop operations it is of prime importance that a study be prepared which analyzes accurately the repair requirements in relation to the demands for motive power. Each individual locomotive or class of locomotive must be studied to determine how many times under existing conditions the locomotive will come to the shop for classified repairs in a given period of time. Each group must further be analyzed to determine what parts and how many parts must be handled each time the locomotive comes to the shop. Next must come the determination of the ratio of new parts to repaired parts which must be routed through the shop. From this information it is possible to prepare an analysis of departmental requirements. An example of such an analysis for driving box work is shown in Table I. Inasmuch as 75 per cent of the labor in repairing a locomotive in the back shop is expended in the erecting, boiler and machine shops, the preliminary time studies based on all the operations and groups in these three departments should begin to show the way to the opportunities for major savings. Similar studies must be made in connection with freight car work and in the engine terminal; while in the latter case there are a greater variety of conditions to deal with it is just as important that such a study be made.

The accurate control of costs cannot be accomplished unless the details are known and compiled on a sufficiently accurate basis to permit absolute comparisons to be made month by month and unit by unit. It is not enough to know that a Class 3 repair job on a particular locomotive cost $5,800 and involved 4,970 man-hours of shop labor, unless it is also known what the total cost and the labor expenditure were the last time it went through the shop and *why* the current figures are greater, or less. Likewise the knowledge that of the 4,970 man-hours of labor expended 1,640 man-hours involved the erecting shop, 1,040 the boiler shop and 993 the machine shop is of no particular value unless these figures can be compared with expenditures in connection with other shoppings of the *same* locomotive. A study of the machine shop, for example, should be broken down into an analysis of man-hours and machine-hours, the latter in a manner such as that shown in Table I, so that comparisons of the machine work involved in several shoppings of the same locomotive will provide the supervisor with specific facts that will enable him to determine where the losses are, why they exist, and what must be done to stop them. Without such facts no intelligent action can be taken.

Can Repair Costs Be Reduced?

Before attempting to answer the question, "Can Repair Costs Be Reduced?" let the mechanical officer or supervisor apply the yardstick of modern practice by making an imaginary visit to an "average" railroad shop



Modern Methods and Facilities in Freight Car Shops Have Demonstrated Ability to Keep Repair Expense at a Minimum

—not one built within the past 10 years, but 15, 20 or 25 years ago. As railroad shops go these are comparatively "modern". True it is that machines and other facilities have been installed from time to time but still we find that from 60 to 75 per cent of the machine tools are from 10 to 30 and 40 years old. Consider this fact in the light of the progress that has been made in machine tool design within the past 10 years and the added fact that very few machines built more than 10 years ago can profitably use the modern tool steels because they do not possess the power and rugged construction necessary to operate at the high speeds and heavy feeds which present-day cutting tools will permit. A glance at the average shop will still show many machines driven from line shafts, in spite of the known economies of individual motor drives.

Table I—Time Study of Machine-Tool Operations Required on Driving-Box Work to Perform Class 2 and 3 Repairs on 50 Locomotives per Month

	Number of parts	Per cent of parts repaired	Number of parts repaired or renewed	Time for each part Hr.-min.	Total time for parts Hr.-min.	Total time mach. Hrs.*
ONE 36-IN. BY 16-FT. 3-HEAD DRIVING-BOX MILLING MACHINE						
Mill inside faces, edges and shoe and wedge faces, 1 set-up (new driving boxes)	500	10	50	0 45	37 30	....
Mill shoe and wedge faces of old and new driving boxes after brass liners have been poured	500	100	500	0 15	125 0	203.1
ONE 48-IN. BY 16-FT. PLANER						
Dovetail shoe and wedge face on new driving boxes	500	10	50	1 0	50 0	62.5
ONE 42-IN. VERTICAL TURRET LATHE						
Face new driving boxes, and dovetail for hub liners	500	10	50	1 30	75 0	....
Cut off hub liners and true the dovetail on old driving boxes	500	90	450	0 20	150 0	281.3
TWO 54-IN. DRIVING BOX BORING AND FACING MACHINES						
Bore and face hub plates on old and new driving boxes	500	100	500	0 25	208 20	130.2
ONE 30-IN. DRIVING BOX SLOTTER						
Slot driving box crown brass and cellar faces (new boxes)	500	10	50	0 40	33 20	....
True up crown-brass face of old boxes	500	90	450	0 20	150 0	229.2
TWO 30-IN. DRAW-CUT SHAPERS						
Plane driving box crown brasses, new and old driving boxes	500	100	500	0 48	400 0	250.0
ONE 36-IN. DRAW-CUT SHAPER						
Shape driving box cellars (old and new)	500	20	100	0 30	50 0	62.5
THREE 4-FT. RADIAL DRILLS WITH 6-FT. ARMS						
Drill and tap for hub liners and shoe and wedge liner bolts:						
New driving boxes	500	10	50	1 0	50 0	....
Old driving boxes	500	60	300	0 30	150 0	....
Drill and ream for crown brass plugs:						
New driving boxes	500	10	50	0 20	16 40	....
Old driving boxes	500	90	450	0 10	75 0	....
Drill driving boxes and cellars and tap for bolts	500	10	50	0 20	16 40	....
Drill driving boxes and cellars for bolts, old boxes	500	90	450	0 10	75 0	....
Drill oil holes in:						
New driving boxes	500	10	50	0 20	16 40	....
Old driving boxes	500	90	450	0 15	112 30	213.5
TWO 100-TON HYDRAULIC VERTICAL PRESSES						
Press out crown brasses	500	100	500	0 05	41 40	52.1
Press in crown brasses	500	100	500	0 05	41 40	52.1
ONE 1,000-LB. CAPACITY BRASS FURNACE						
For casting hub liners and shoe and wedge liners on driving boxes	500	100	500	0 30	250 0	312.5
ONE 4-FT. BY 6-FT. FACE PLATE						
Laying off driving boxes, chipping, etc						
TOTAL NUMBER OF MACHINE HOURS						2,656.2

* Including 25 per cent additional time for shop order work.

One of the reasons why industrial plants have made the progress they have is because the modern industrial production engineer is constantly exchanging ideas with men in other plants and spends a substantial part of his time visiting other plants. Unfortunately this practice is not common in the railroad field with the result we meet many shop supervisors who know all too little about what is going on in their own field of work. Were it possible for the average shop supervisor to make a tour of inspection of some of our best operated railroad shops these are some of the things he would see:

1. Driving boxes, with a 12-in. bore, 15 in. long being bored in an average time of 13¾ min. and a minimum of 10 min., floor to floor.

2. New 52-in. wheel centers finished complete on a boring mill in 5 hr. flat.

3. Tires, 66 in. diam., being bored at the rate of 20 tires in 8 hr.

4. Driver tires, 62 in. diam., being turned in 26 min., and 56 in. tires turned in 23 min.

5. Wheels 33 in. diam. being turned at the rate of 29 pairs in an 8-hr. day.

6. 5½-in. by 10-in. car axles finished complete in an average time of 30 min., floor to floor.

7. Milling driving boxes complete in 47 min. at one setting, including shoe and wedge faces and rolls.

8. Milling shoes and wedges in an average time of 2 min. each.

9. Grinding new piston rods to size in 20 min.

10. Milling 143-in. alloy steel main rods, including channeling, complete in 7 hr.

11. Grinding $1\frac{5}{16}$-in. by 6½-in. tapered bolts from rough forgings of .50 carbon steel to limits of .001 in. in diameter at the rate of 70 bolts an hour, including wheel dressing time.

12. Finishing plain type front cylinder heads complete and ready to apply in 1 hr. 30 min.

13. Finishing 28-in. gun iron pistons complete in 58 min.

14. Machining 30-in. bullrings complete in 70 min.

15. Boring, facing and turning valve chamber bushings complete in 60 min.

16. Producing piston packing rings in an average time of 6½ min.

17. Finishing floating rod bushings, boring, turning and facing, complete in 15 min., floor to floor.

Can these performances be duplicated in your own shop? If not, why? These are merely a few ordinary jobs selected at random from the hundreds that are performed every day in the average railroad shop and a comparison of your own shop time on these and other jobs will enable you to tell whether or not you are producing locomotive parts at minimum cost.

How About the Engine Terminal?

Consider the "average" enginehouse with many of its machine tools that were obsolete when they were discarded at the back shop. They never should have been re-installed in the enginehouse machine shop at all and they have been costing the company money every day

since they were put in service. How many enginehouses still put up front ends and air pumps with a manually operated hoist when a modern electric truck would do the job at a fraction of the cost? How many enginehouses still change wheels, trucks and springs with obsolete home-made drop pit jacks when a modern drop table, power operated, would make these operations cheaper, safer and save hours of time that a locomotive might otherwise spend in revenue service.

It has been conceded by many mechanical officers that, aside from the proper machine tool equipment to perform the work demanded by an enginehouse machine shop the four developments of the last few years that have contributed immeasurably to engine terminal economies have been the electric crane truck, the electric drop table, boiler washing and direct steaming, and modern coal and ash handling facilities. For the benefit of those who may not yet have availed themselves of these up-to-date facilities a few references out of the records might prove interesting:

1. An investment in a complete boiler washing and direct steaming layout amounting to $86,000 saved the railroad $24,000 a year.

2. An installation of an electric drop table reduced the time of changing a switch engine tire from 10 to 4 hr. and saved $9.00 in the cost.

3. Another drop table cut the time of changing tender wheels from two hr. to 30 min. and reduced the cost by $5.00.

4. A driver spring can be changed on the same drop table in 15 min. where it formerly took 3 hr.—Saving $8.00.

5. Raising the front end of a locomotive with the drop table now takes 10 min. instead of 3 hr.—Saving $4.80.

6. Changing a trailer hub liner can be accomplished in 30 min. instead of 4 hr.—Saving $4.80.

7. An electric crane truck saved $380 a year on the handling of main rods alone, not to mention such jobs as these:

	Former Cost	Present Cost
Removing an 8½ in. C. C. pump	$1.68	$0.629
Applying a 9½-in. pump	1.17	.42
Applying a smokebox front	3.00	2.01
Tires brought in from outside and placed at engine	.24	.03
Tank wheel transferred from one track to another	.26	.09
Applying a main reservoir	1.26	.63
Applying a steam dome cover	4.76	1.65

8. Modern coal and cinder handling plants are able to take care of all the coal and ashes around a modern terminal at costs varying from 7 to 14 cents per ton including interest and depreciation. Specific installations show annual savings of $4,200 and $3,200 on investments of $10,000 and $8,800 respectively.

The Freight Car Shop

The progressive or "spot" system of repairing freight cars has undoubtedly been the most important factor in the reduction in freight car repair costs. Along with the fact that the trend over the past few years has been toward the repairing and rebuilding of cars by series there has been a very definite indication that costs may be still further reduced, on the larger roads particularly, by the specialization of work at individual shops on specific types of cars. The great advantage of the progressive system is in the ability to concentrate both materials and labor, and once the repair problem on cars has been reduced to a consideration of unit operations opportunities for making savings become evident. Those roads that have made detail studies of car repair operations have found that the handling of materials and repair equipment around the shop is usually one of the greatest sources of lost shop time and the installation of power cranes and trucks, power-operated jacks and car straightening devices have reduced by many hours the labor required to rebuild a car. Spray painting, a development of recent years, has not only reduced painting time but has made it possible to do a much better job.

Three phases of freight car repair work offer particularly attractive opportunities for economies—wheel work, truck repairs and rebuilding and the fabrication of steel car parts. Modern wheel shop machinery has made it possible for a centrally located wheel repair plant to handle thousands of wheels and axles annually and supply the needs of the average railroad with a comparatively small force. Specialized truck repair shops with the proper facilities for handling truck parts are able to keep pace with any demands made upon them. The fabrication of steel car parts, because of the variety of shapes, has always involved an extensive layout of presses, furnaces, and punches and shears. Some roads have made detailed studies of this phase of repair work and have found it more economical to purchase these parts in fabricated form ready to apply to the car.

It can be said that real progress has been made in reducing car repair costs but there is still much to be done and the investigation of practices in the average light and heavy car repair shop will show that much improvement can be made by the installation of modern repair facilities.

Conclusion

Economies in equipment maintenance in the future are going to be made by the more intensive utilization of facilities. Obsolete repair facilities at outlying points must be abandoned and repair work centralized at important points where the increased volume of work due to the centralization of heavy repairs will make it economically possible to install only the most modern facilities and methods. There is every indication that it is going to be worth while for the railroads to replace much obsolete motive power and rolling stock with up-to-date equipment. In the case of locomotives particularly the replacement of obsolete power with a smaller number of modern locomotives will permit a nearer approach to standardization of parts and that such parts can be designed and manufactured with the idea of interchangeability in mind. It is probable that it will no longer be possible to consider investment in repair facilities upon the assumption that increases in traffic will produce the revenue to pay for them. They must be paid for out of savings over present practices.

There never was a time when it seemed so desirable for the railroads to consider the advisability of making a thorough study of the entire problem of equipment maintenance. In view of the progress that has been made in industry generally there can be no question of the opportunities for cutting equipment repair costs but before an intelligent start can be made facts will have to be developed to show where and why the present losses exist. The mechanical creations of American industry are already available and ready to serve the railroads in stopping these losses.

Just one thought in conclusion: Ten years ago the average locomotive spent one-third of its time on the road and two-thirds in the enginehouse. Today that is no longer true. Why, then, should a four-million-dollar railroad shop be operated only eight hours a day when by extending its operation to 16 or even 24 hours the same facilities could be made to restore twice as much locomotive mileage to revenue service?

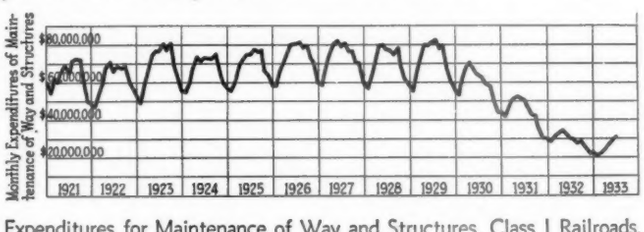
The Physical Condition of Tracks and Structures Has a Definite Bearing on the Effectiveness and Safety of Train Operation

Railroads Far Behind in Maintenance of Tracks and Structures

Inadequate expenditures during the last four years have resulted in enormous accumulation of deferred renewals

IT will be necessary to spend about $700,000,000 to restore the fixed properties of the railroads to the high standard of physical condition that they enjoyed at the close of 1929. This is the penalty that they must pay for the most remarkable adventure in retrenchment in railway history. It is possible that four years of depression have taught lessons in economy and prudence that will exert a profound influence on policies pursued by the railways in the conduct of maintenance of way operations in the future, but measured by the only available yard stick, namely, the record of past years, they are faced with an enormous outlay to make good the deferred maintenance of the last four years, and to which must be added the funds necessary for the continuation of the program for the betterment of roadway and structures that was discontinued with the advent of the depression. This entailed capital expenditures averaging $475,000,000 annually for the five years 1925-1929, inclusive.

The story of this period of retrenchment is especially interesting because each succeeding year of the depression brought new low levels of expenditures—in fact, it is doubtful if there was a maintenance officer in the employ of the railroads in 1929 who even dreamed that it would be possible to keep the tracks and structures in a condition approaching safety with expenditures as low as those that have prevailed during the last two years. The outlay for maintenance of way and structures



Expenditures for Maintenance of Way and Structures, Class I Railroads, by Months

for every month from October, 1930, to date, has been less than the normal expenditures during the months of January and February of 1925 to 1929, inclusive, when operations were on what had long been termed the "winter basis." But each year brought new low levels —the maximum expenditure in any month in 1931 was less than the expenditures in January and in February

Expenditures for Maintenance of Way and Structures, Class I Railways

(Thousands)

	1925	1926	1927	1928	1929	1930	1931	1932	Average, 1925-1929 (Inclusive)
Superintendence	$54,158	$56,090	$57,695	$58,434	$59,934	$57,198	$49,324	$36,222	$57,262
Roadway Maintenance	77,254	82,918	89,595	82,385	86,336	64,794	48,575	32,048	83,698
Tunnels	2,995	2,720	2,465	2,361	2,500	2,087	1,774	1,467	2,608
Bridges, Culverts, etc.	43,963	44,325	41,823	42,549	44,693	37,612	28,123	19,435	43,471
Ties	118,499	115,646	116,917	114,038	109,195	91,224	72,651	50,305	114,859
Rails	44,163	48,845	49,764	50,045	44,191	34,639	25,960	13,762	47,402
Other Track Materials	47,633	51,342	50,553	48,287	43,955	36,296	26,505	15,727	48,354
Ballast	16,336	20,146	20,043	19,392	20,980	13,262	8,601	4,943	19,379
Track Laying and Surfacing	200,837	218,460	218,108	207,433	210,496	172,136	131,274	83,411	211,067
Fences and Snow Sheds	5,522	6,058	5,619	6,230	5,727	4,494	3,119	2,133	5,831
Crossings and Signs	12,610	13,068	12,874	13,092	13,933	12,632	9,656	6,427	13,115
Buildings	75,771	81,580	78,885	76,591	82,173	63,836	42,539	27,976	79,000
Water Supply	10,832	10,892	10,416	9,898	10,182	8,944	6,299	3,952	10,444
Tools and Equipment	16,985	18,826	17,668	17,812	19,860	16,534	11,834	7,909	18,230
Injuries	5,553	6,035	6,434	5,680	5,834	5,424	3,941	2,812	5,907
Miscellaneous	83,332	89,868	89,723	83,679	95,366	73,145	60,438	42,551	88,396
Total	$816,443	$866,819	$868,582	$837,906	$855,355	$705,471	$530,613	$351,077	$849,021

of 1930, and again in 1932, the maximum monthly expenditure was lower than in January and in February, 1931. Corresponding cycles of low levels are to be seen in the chart of maximum and minimum forces employed.

It is also of interest to note that in 1930, 1931 and 1932, May was the month of most active operations. In other words, the spring upturn in operations was abruptly terminated in that month, to be followed by a steady decline in expenditures that continued until the following February. This cycle was repeated in three successive years, resulting in a total decline to such profound depths that the moderate upward trend through June, July and August of 1933, while sounding the first note of real encouragement, is after all insignificant compared with the total depression of maintenance operations that has occurred since 1929.

However, mere consideration of the decline in expenditures does not of itself offer a definite index of the deficiency in maintenance. The unprecedented reduction in expenditures during the last three years is the result of efforts of the managements to meet the grave problems imposed by the diminishing revenues. That the maintenance of way department has contributed its full share to this retrenchment, and more, is indicated in the table below, which shows how the ratio of maintenance of way expenditures to total operating expenses has declined since 1929.

1923	16.8	1928	19.8
1924	17.8	1929	19.0
1925	18.0	1930	17.0
1926	18.5	1931	14.5
1927	19.0	1932	14.8

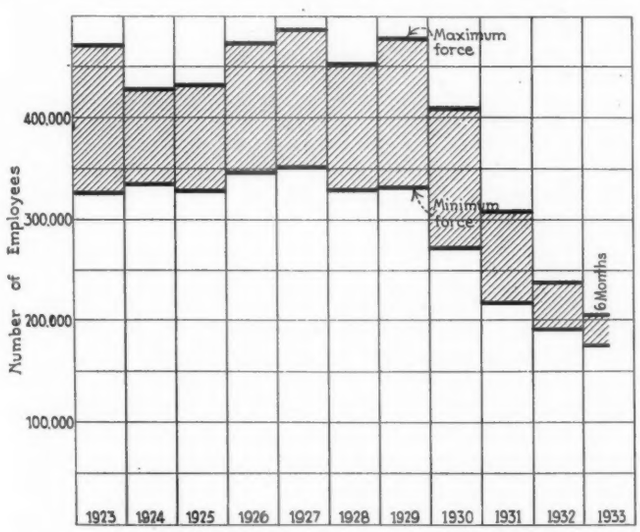
Wear and tear on the property decreases, of course, with a decline in the volume of traffic moved, but there is little direct relationship, except in the case of rails. Traffic exerts a minor influence on the life of ties, it has almost no effect on bridges and still less on buildings. Therefore, the fact that expenditures for maintenance of way and structures have decreased but little faster than the decline in gross ton-miles does not afford any measure of their adequacy or inadequacy, because it takes no account of the depreciation that is caused by the elements rather than use. To arrive at any valid conclusions with respect to the extent of the deferred maintenance it is necessary to consider the various primary elements separately.

Maintenance of Roadway and Track

Roadway and track consume the greater portion of the funds allocated to maintenance of way and structures. Thus, from 1925 to 1929, inclusive, the expenditures of the Class I railways for roadway, ties, rails, other track materials, ballast, track laying and surfacing, fences, crossings and signs, and snow and sand fences, etc., averaged $543,705,000 annually for the five years, or 64.3 per cent of the total outlay for maintenance of way and structures. The corresponding expenditure in 1930 was $429,477,000, in 1931 it was $326,341,000 and in 1932 it was $208,756,000, or an accumulated decrease, compared with the five-year average, of $666,541,000. However, as there is a decrease in the need for maintenance with decreased use, it is necessary to study track maintenance from the standpoint of the materials applied.

Rail Renewals Far Behind

Rail renewals are predicated more nearly on the traffic carried than is the case with any other item of replacements. The status of rail renewals is shown in the table below and in one of the charts.



Maximum and Minimum Forces Employed in Maintenance of Way and Structures 1923-1933

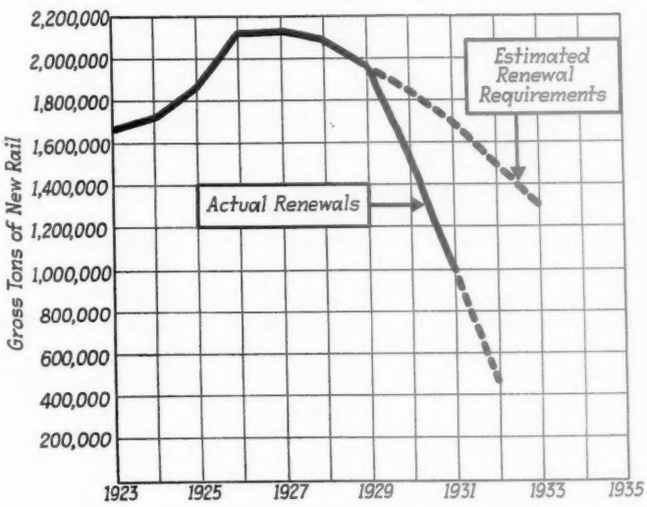


Chart Showing Estimated Deficiency in Rail Renewals

Year	Gross Tons of Rail Laid in Replacements
1923	1,700,000*
1924	1,700,000*
1925	1,900,000*
1926	2,100,000*
1927	2,124,765
1928	2,080,277
1929	1,958,489
1930	1,517,002
1931	984,900
1932	394,007

* Estimated.

While it is obvious from these figures that rail renewals were inadequate during 1931 and 1932, it is not so easy to arrive at a quantitative measure of the undermaintenance that would be generally accepted. An approximate method is to determine the relation of the number of tons of rail laid in replacement in any year to the gross ton-miles of traffic in a period of, say, seven years ending with the year of renewal, and com-

pare this relationship with the corresponding figures for other years. This computation shows that the renewals in 1929 amounted to 233,000 tons of rail per trillion gross ton-miles, a figure that compares with 259,000 tons for 1928 and 278,000 tons for 1927, and indicates a declining rate of renewals—possibly the effect of improved practice in rail maintenance; for example, the building up of battered ends. Assuming that this decline in rail renewal requirements would continue through to 1934, the calculated requirements for 1930, 1931, 1932 and 1933 were approximately 1,850,000, 1,700,000, 1,500,000 and 1,300,000 tons, respectively. Deducting from the sum of these figures the total tonnage of rails actually laid in the last 3½ years, one arrives at a total of about 3,400,000 tons as the deficiency in rail renewals at the end of 1933.

Because this estimate is based on the assumption that the life of rail is increasing, in terms of the traffic carried, it is believed to be conservative. Whether it will serve as a measure of the ultimate demand for rails in the near future will depend on the policy adopted by the railroads with respect to the weight of rail. Not only have the results of research pointed to the economy of a higher ratio of rail weight to traffic than that which has been deemed adequate heretofore, but there has been a rather general movement toward the adoption of heavier sections. This is clearly brought out in the chart showing miles of main track laid with different weights of rail; the increase in mileage is limited substantially to sections weighing 105 lb. per yard or more. However, the mileage in rails of these weights is still a relatively small proportion of total mileage of important main tracks.

Inadequate Tie Renewals

With ties, the service life is so largely dependent on their resistence to decay that the factor of traffic may be ignored in approximations designed to indicate the current deficiency in renewals for the railway mileage as a whole. Therefore, with the data available on tie renewals, it is not difficult to arrive at a reasonable estimate of the deferred replacements. The facts with respect to tie renewals are clearly shown in the chart. There was a gradual falling off in replacements from 1922 to 1929, followed by a sharp and almost straight-line drop through 1930, 1931 and 1932.

The decline in renewals from 86,641,834 crossties in 1922 to 74,679,375 in 1929 was obviously the result of the greater life obtained by reason of the treatment of a greater proportion of the ties placed in the last 10 or 15 years, together with the use of larger plates and a general improvement in practice. There is ample justification for the assumption that this downward trend in requirements will continue, as indicated by the dotted line on the chart, so the deficiency in renewals is indicated on the chart by the lengths of the vertical lines between the line of actual renewals and the line of estimated requirements. This indicates a deficiency of 60 million ties at the end of 1932, which by the end of 1933 will have increased to between 80 and 90 million ties. In other words, there are now in track more than 75 million ties that would, under more normal conditions, have been renewed.

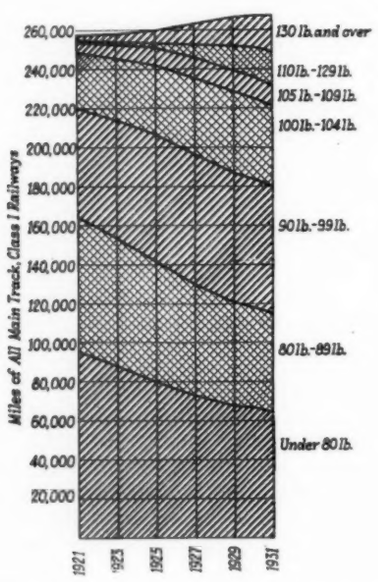


Chart Showing the Trend toward the Use of Heavier Rail

Contrary to first thought, there does not appear to have been an appreciable reduction in the quality of the ties inserted during the last three years. A few roads have increased the proportion of untreated ties—one road that had been using practically 100 per cent treated ties reverted to 100 per cent untreated ties in 1932. On the other hand, there are several roads on which the proportion of treated ties placed in 1932 was greater than in 1929, but the net result has been a moderate decline in the percentage that the treated ties bear to the total of wooden ties inserted in track—from 79 per cent in 1929 to 78.5 per cent in 1930, 77.5 per cent in 1931 and 75.3 per cent in 1932. Furthermore, there is no doubt that not a few roads that would have entered the ranks of the large users of treated wood under normal conditions have been deterred from taking this step because of the depression. As a consequence, wood preservation has failed to make the progress that would otherwise have followed as a matter of course. Furthermore, the drastic deficiency in tie renewals over a period of four years will introduce a disturbing factor in future tie requirements that will show its effect in the records 10 years hence.

The following table of expenditures for ballast by Class I railroads is also indicative of the marked falling off in the application of materials to make good the losses due to use.

Year	Expenditure for Ballast (Maintenance Only)	Percentage of Total Maintenance of Way Expenditures
1925	$16,336,000	2.01
1926	20,146,000	2.33
1927	20,043,000	2.31
1928	19,392,000	2.32
1929	20,980,000	2.45
1930	13,262,000	1.88
1931	8,601,000	1.62
1932	4,943,000	1.40

This table shows not only a reduction in the application of ballast in 1932 of 76.5 per cent from the total in 1929, but it shows also that a decreasing proportion of the total appropriation for maintenance of way has been allotted to ballast; in fact, only a little more than half as much in 1932 as in 1929.

This trend toward the allocation of a decreasing proportion of the total expenditures for the renewal of materials is evidenced in the increase in the percentage going for labor, which percentage increased from 54.3 per cent in 1929 to 55.4 per cent in 1932, while, if allowance is made for the 10 per cent reduction in wages effective March 1, 1932, the percentage for 1932 was 59.4 per cent. For the first half of 1933, the corresponding figure was 60.4 per cent. This means, of course, that railway maintenance organizations have, by force of necessity, been expending an increasing share of their energies in general upkeep, that is, in keeping the tracks in a safe and usable condition rather than making

good the deterioration of physical parts by replacements. Take the following table of expenditures of Class I railroads for roadway maintenance, and for track laying and surfacing. While the amounts have been subjected to great reductions, the percentage relationships have changed but little.

Year	Roadway Maintenance (Account 202) (Care of the Roadbed)	Per Cent of Total Maintenance of Way Expenses	Track Laying and Surfacing (Account 220)	Per Cent of Total Maintenance of Way Expenses
1925	$72,254,000	9.0	$200,837,000	24.8
1926	82,918,000	9.7	218,460,000	25.5
1927	89,595,000	10.4	218,108,000	25.5
1928	82,385,000	10.0	207,433,000	25.1
1929	86,336,000	10.5	210,496,000	25.5
1930	64,794,000	9.3	172,136,000	24.8
1931	48,575,000	9.2	131,274,000	24.7
1932	32,048,000	10.8	83,411,000	23.8

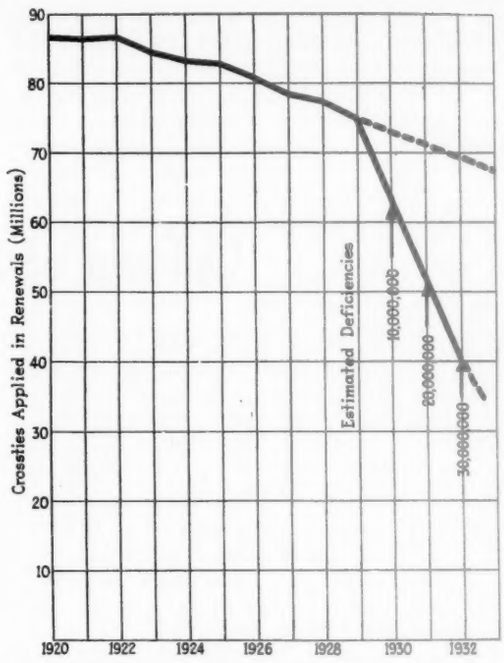
Thus, it is evident that effort is being concentrated on those phases of maintenance of way work that will make for the maximum of safety in train operation and it would appear that the railways have been reasonably successful in this endeavor. Table 66 of the Annual Accident Bulletins of the Interstate Commerce Commission records train accidents ascribed to defective or improper maintenance of way and structures, and a study of this table in the bulletins from 1925 to 1932 shows a continuing decline in the ratio of accidents to train miles. Accidents also continued to decline in 1933, until May when the sharp rise in traffic was attended by a corresponding rise in accidents, and without doubt, a study of these accidents by causes (when the complete data are made available), will show an increase in the proportion ascribed to defects in maintenance of way and structures.

Conclusion

That railway managements are alive to the deficiency in the maintenance of tracks is evidenced by the alacrity with which they responded to President Roosevelt's plan for the allocation of a considerable sum from the public works fund for the purchase of rail at a reduced price. But this is only a start, for it is not alone for rail and track fastenings that money must be spent. All elements of the track must be restored to normal condition, which gives rise not only to a demand for all manner of materials but also to expenditures for the restoration of work equipment to a usable condition, the replacement of worn out or obsolete units, etc. True, the railroads now possess a surplus of such appliances, but much of the equipment is old and should not be returned to service. Typical of this condition is the present status of track motor car ownership. According to information obtained recently in the course of a thorough survey, the railroads of the United States own about 52,800 of these cars, of which only 10,500 are less than 5 years old, while 23,500 are from 5 to 10 years old, 11,700 are from 10 to 15 years old and 7,100 are more than 15 years old.

A Suspended Improvement Program

That the railroads have profited immeasurably from investments in improved construction is demonstrated by the usable condition of their properties after nearly four years of under maintenance. This situation stands out in sharp contrast with that prevailing in the first decade of the century when the railways failed by a considerable margin to increase the strength of their tracks and structures in proportion to the increase in the volume and weight of traffic, and which was brought to a culmination in 1917 when a decline in maintenance operations, because of shortages of both materials and



Annual Crosstie Renewals—Actual and Estimated Requirements

labor, resulted in a rapid deterioration of the tracks under the heavy war-time traffic.

The program for improvement which was undertaken following the end of federal control had for its initial incentive the reconditioning of the properties to make good the deficiencies resulting from the suspension of betterment programs during the war period, in a word, to catch up with the current increases in the weight of rolling stock. This work was of utmost importance because of the excessive cost of maintenancing tracks of the generally prevailing standards of construction.

However, following the experience of a few roads with tracks possessing a much higher ratio of strength to the volume and weight of traffic imposed, there was a rather general awakening to the possibilities of heavier track construction from the standpoint of economy in maintenance. Decisions as to ballast section, size and number of ties, the weight of rail and the character of accessories were no longer founded solely on the exercise of judgment as to what would *stand up* under traffic. Instead, the prospect of the savings to be realized in maintenance expenditures became an important factor.

The full return on heavier track construction is not realized for some years after the investment has been made. Consequently, it was not until the later years of the Twenties that the returns to accrue from stronger track were fully realized, and that statistical analyses of the service performance of actual installations were confirmed by scientific studies supported by experimental data. For this reason, as previously stated, the movement toward a marked increase in weight of rail was still in its early stages by the end of 1929.

More progress had been made in the general adoption of treated ties, but even here, the practice is still far from universal, and policy with respect to the dimensions of tie plates is still such as to leave much to be desired from the standpoint of adequate protection of the ties against wear.

Of a more remarkable character is the movement to obtain better roadbed drainage through the application of methods and systems that had been developed during the last 10 years, and which have virtually revolutionized drainage practice. This embraces ditching equipment that places within economic reach projects for improved

drainage that previously involved excessive expenditures, as well as new types of drainage pipes and a new technic for their installation that have been effective in the curing of soft roadbed conditions, which had previously defied correction at any reasonable expense. Since 1929, work of this character has been confined to curing of extreme cases of soft roadbeds, or what might be termed emergency work, but there is a broad field for the attainment of more stable track and reduced expenditures for track surfacing, by resuming programs of drainage work through the installation of improved drainage systems.

Upkeep of Bridges and Buildings

During the five years ending with December 31, 1929, the Class I railways spent an average of $125,079,000 annually for the upkeep of bridges, culverts, trestles, tunnels, buildings and other structures, exclusive of water service facilities. In 1930, the corresponding figure was $103,535,000, in 1931 is was reduced to $72,436,000 and in 1932 it had fallen to about $48,878,000, these totals representing reductions of 17.3, 42.2 and 61 per cent from the five-year average. Based on a study of these figures, it is estimated that the deficiency in the maintenance of structures at the end of 1933 will amount to about $120,000,000.

In arriving at this figure, due consideration was given to the fact that maintenance expenditures in the years prior to 1930 included operating charges incident to heavy improvement projects, and to the fact that the depression has resulted in a reduction in prices and an appreciable increase in the productivity of labor. A deduction was made also for the decrease in maintenance requirements by reason of the decline in traffic, although this, after all, is a minor factor in most railway structures. However, no effort was made to evaluate the effect of abandonments, although it is known that many buildings and not a few other facilities have been taken out of service during the last three years, temporarily in some cases and permanently in others, with the result that accumulated deferred maintenance on such structures is automatically wiped out. But this is a factor incapable of expression in figures, and its effect on the total would certainly be a minor one.

Deferred Work Costs More

On the other hand, there is a further element that must not be overlooked, namely, the greater expense of correcting maintenance deficiences that have been too long deferred. This is an especially important point in the case of bridges and buildings. The cost of painting a steel bridge is greatly increased if the work is delayed so long that much time and effort must be consumed in the scraping, chipping, brushing or sand-blasting of badly corroded or scaled surfaces. There is also the hazard of permanent deterioration or appreciable loss of section. In buildings, deterioration always proceeds at an accelerated rate if minor defects are not corrected promptly. Consequently, a period of retrenchment in the maintenance of structures is certain to give rise to repair work of a character that would not be required if current deterioration were checked in the course of routine maintenance operations. There are still other factors to be taken into account in arriving at a correct conclusion with respect to the extent of deferred maintenance, but these will be taken up in another part of this discussion.

As in the case of track maintenance, the first responsibility of the bridge and building maintenance officer is for safety of traffic. This is reflected in the relative trends of expenditures on bridges, trestles, culverts and tunnels, on the one hand, and of those for buildings, on the other, for the condition of the first group of structures has a direct bearing on the safety of train movements, whereas with minor exceptions, the condition of buildings does not. Thus, during the five years, 1925 to 1929, inclusive, the outlay for the maintenance of bridges, tunnels, etc., averaged 5.6 per cent of the total of all maintenance of way and structures expenses, while that for buildings was 9.5 per cent of the total. In 1930, 1931 and 1932, the corresponding figures for bridge maintenance were 5.7 per cent, 5.6 per cent and 5.9 per cent, respectively, while for buildings they were 9.2 per cent, 8.0 per cent and 8.0 per cent, respectively. Expressed in another way, the outlay for bridges in 1932 was 45.3 per cent of the five-year average, while that for buildings was 35.4 per cent. In other words, relatively greater attention has been given to those structures whose condition has a bearing on safety of transportation.

Postpone Bridge Replacements

Bridge maintenance operations embrace both the complete replacement of structures and the conduct of current repairs, including such items as painting and the renewals of such minor parts as bridge ties. Complete renewals are required both to replace weak or inadequate structures and to retire those that have deteriorated to a point that excessive maintenance work is required. Owing to the extensive programs of bridge replacement and betterment carried on by the railways during the last two decades, in the face of rapidly increasing train loads, and because of the more moderate increase in the weight of locomotives and cars in recent years, inadequate load-carrying capacity is no longer a primary reason for bridge renewals.

Improvement programs of the past have also been fruitful of better types of bridges—bridges better equipped to resist the ravages of the elements. This is owing in part to the replacement of wooden structures with those of concrete masonry, and of untreated wooden bridges with structures built of creosoted timbers. However, there still remains the need for protecting metal bridges from corrosion by periodic painting, and even this does not suffice for the structures or parts of structures subject to conditions especially favorable to corrosive action, for example, exposure to brine drippings and locomotive gases. Furthermore, it is impossible to provide against every condition that results in structural deterioration, with the consequence that there is always some maintenance work to be done on all types of structures.

Unfortunately, also, most roads are still required to deal with one type of structure that gives rise to extensive maintenance and frequent renewals, namely, pile and frame trestles of untreated wood. The life of these structures has been so definitely established by experience that it is possible to predict with a reasonable degree of accuracy the volume of the renewal requirements several years in advance. Consequently, a rail-

way with any appreciable number of these trestles is confronted with much more positive need for annual bridge renewals than a road having a larger proportion of bridges of more permanent types.

Faced with the necessity for a curtailment of expenditures, the railways have made concerted efforts to postpone replacement work. In the case of metal structures, this has given added incentive to strengthening and repair work. In the case of trestle bridges, it has led to the addition of piles, the replacement of caps, stringers, etc., and other heavy repairs beyond limits that have proved economical under normal conditions. At the same time, current repair work has been confined to those items that have a direct bearing on safety. Painting has been largely postponed, although there has been a marked variation in the policy on different properties. In some cases, the work is confined to the spot application of priming coats.

In the case of buildings, primary attention is being given to roofs, but in not a few instances work has been confined to patching in lieu of renewals far beyond the limits of true economy. Accident hazards are also being carefully watched; for example, the need for new planks in platforms or freight house floors, the narrowing of operating clearances by reason of leaning platforms or sheds, etc. Still another important consideration is the condition of service structures in terminals to insure against defects that would interfere with the dispatching and operation of trains.

One source of reductions in expenditures that has been developed to the utmost is the abandonment of the use of buildings, made possible by the closing of various facilities such as follow the temporary or permanent consolidation of terminals. In many cases no maintenance work is being done on structures in this category.

More Emergency Work

Almost any discussion of maintenance work is sure to give rise to comments on the increased efficiency of the forces, not only by reason of the greater productivity of the men in the gangs, but also because the foremen are more alert and the work as a whole is more closely supervised. But much of the advantage thus gained is offset by the fact that an increasing proportion of the work of the forces is handled on an emergency basis. As renewals and repairs are postponed, the interval of time that can be allowed between the authorization of the work and the date of its completion must be reduced. Consequently, the proportion of the work that must be done within a given time limit, rather than at such time as best suits the need of a well ordered program, has been greatly increased. This means that the economies of regular scheduling of the work, such as decreased loss of time in moving and the savings incident to the orderly delivery of materials are being sacrificed more and more to meet the demands of the jobs that "can't wait."

Thus, it is seen that the railways have deferred a large volume of expenditures for the maintenance of structures, and that some of the work left undone will cost more when it is eventually completed than it would have cost if it had been done in season. Some structures have been taken out of service, and with respect to certain of these as well as to some of those in need of repair, the question that must be answered is whether they should be restored to usable condition or replaced. Moreover, the answer is contingent to a greater extent on the suitability of the structure for present needs than is always realized. In the case of small stations, for example, it is not beside the point to suggest that the type of structure has some bearing on the general problem of the merchandising of transportation. This does not necessarily mean a larger structure—in fact, the real need may be for a smaller one, more attractive and better suited to present-day needs.

Better Structures Needed

Reference was made in previous columns to the advantages enjoyed by some railways compared with others in the maintenance of bridges, because of a marked superiority in the types of structures. This is illustrated in the following table showing the lengths of different types of bridges, in terms of the relation they bear to the total lengths of all bridges, on five roads in the Southwest:

	Percentages Which Lengths of Four Types of Bridges Bear to Total Lengths of All Bridges				
	Road A	Road B	Road C	Road D	Road E
Steel and Concrete Bridges.....	5.9	11.1	15.2	29.3	29.0
Creosoted Trestles with Ballasted Decks	15.8	5.1	8.7	7.3	18.8
Creosoted Trestles with Open Decks	53.3	60.7	14.1	57.3	42.0
Untreated Open Deck Trestles....	25.0	23.1	62.0	6.1	10.2

This table discloses the wide difference in the proportion of untreated timber structures, which amounts to 62 per cent for Road C, compared with 25 per cent for Road A and only 6.1 per cent for road D. Obviously, Road C will continue to be confronted with a much more formidable bridge maintenance program than the other roads until such time as the proportion of these short-lived structures has been appreciably reduced. Thus, the problem now confronting the railways with respect to their bridges is not alone that of making good the deferred maintenance, but includes also the resumption of programs for the replacement of structures possessing limited service life with bridges of character that will require much smaller expenditures for maintenance.

Water Service Improvements Must Go On

Deficiencies in the upkeep of railway water service facilities since 1929 have resulted in $12,000,000 of deferred maintenance. This does not mean that the condition of the water stations is such as to require the expenditure of that much money to insure effective service for present demands; rather, it is a measure of the expenditures that must be made before these facilities can be brought back to the condition that prevailed in 1929. However, even this figure does not afford an adequate index of the effect of the depression on water service facilities, for there has been, in addition, an almost complete interruption of the extensive program of water supply improvement that had been under way since the end of federal control and is still by no means complete. This phase of the activities of the water supply department, which involved the Class I railways in capital investments averaging $5,375,636 annually from 1925 to 1929, inclusive, will be discussed later.

Expenditures for the maintenance of way supply, purification and delivery systems by the Class I railways

during the years 1925 to 1929, inclusive, ranged from $9,898,000 to $10,892,000 annually, and averaged $10,444,000. In 1930, the outlay was $8,944,000, a reduction of 14.4 per cent. In 1931, a further reduction of 25.3 per cent brought the expenditure down to $6,299,000, while the outlay of only $3,952,000 in 1932 represents a reduction of 62.2 per cent, from the five-year average.

High Standard of Condition in 1929

There are several reasons why reductions as drastic as these could be made without seriously crippling a service so necessary for effective train operation. In the first place, the general average condition of the water systems was better in 1929 than at any previous time in railway history. The extensive program of rehabilitation had included a large number of new plants, many with duplicate pumping units that provided an alternate or standby service, except during periods of maximum demand. The newer equipment, also, had been selected with a view to low maintenance requirements. But of even greater importance was the fact that railway managements had become educated to the benefits which accrue from a high standard of maintenance made possible by the competent and thoroughly organized supervision of an adequate maintenance force.

The water service facilities of a railroad consist of independent units, some of which may be taken out of service during a period of diminishing traffic without serious embarrassment to the transportation organization. The facilities at terminals and other points of large demand must, of course, continue to function, but the normal maintenance of all water stations is not as imperative a matter as the absolute necessity for the safe condition of every bridge. Where individual stations embody a number of units, as for example, two or more wells, it is possible to meet the needs of a diminished traffic with some of the units in a deteriorated or inoperative condition; in fact, it is not infrequently safe to abandon one or more of them until there is prospect of a greater service demand.

Many Corners Have Been Cut

Faced with the necessity for drastic reductions in expenditures, the water service organization has taken full advantage of the opportunities to cut corners along the lines suggested above. But the retrenchment has been carried much further than the mere deferring of the upkeep of surplus facilities. Concentrating their time and efforts on those features of the plants that are vital to continuity of service, the maintenance forces have given a minimum of attention to the structural elements. The painting of tanks has been postponed, in some cases to a point that has permitted serious deterioration. Tanks, reservoirs and settling basins are not being cleaned out with former regularity. Wells and well screens are being allowed to go uncleaned so long as the volume of water delivered is adequate for immediate needs. Patching and repairs to machinery to avoid replacement have been carried much further than in periods of normal revenue. This is demonstrated by the change in the relation of expenditures for labor to those for material. On one road, for example, which normally spent 55 per cent of its water supply appropriation for labor, the percentage in 1932 rose to around 75 per cent.

Force of necessity has also resulted in frequent violations of a rule that had come to be a source of pride among water service men following the renaissance of water supply during the last decade, namely, that defects in facilities must be apprehended and corrected *before* they result in breakdowns, not afterward. So long as there is a surplus of capacity, this is not a serious matter, but it will take time to key the organizations up to a point where this rule will again be accepted at face value.

The water supply facilities are at present in a condition to meet the demands of the current volume of traffic, and theoretically there is ample reserve capacity to meet the requirements of traffic in pre-depression volume. Actually, however, this nominal capacity is not all available, and it is almost certain that any appreciable increase in traffic or the advent of emergencies, such as a severe winter, would seriously tax the effectiveness of many water supply plants in their present physical condition. Aside from this, there is the deficiency in structural maintenance. Patch repairs can be carried only so far without giving rise to permanent deterioration and the need for premature renewal.

An Interrupted Improvement Program

In view of the evidence of a surplus of water supply capacity, it might be inferred that the only need confronting the railways is that of restoring the existing plants to a normal state of repair and that there could be little justification for additions and betterments to water service. This would be a correct conclusion with respect to projects designed to provide larger supplies, for while it is true that the program of additions and betterments of water service set on foot following the end of federal control had for its primary purpose an increase in capacity, it was not the only objective, and as time went on it was overshadowed by other considerations. Thus, in addition to capacity, better quality of water was an important incentive from the start, but as managements came to realize the benefits of expenditures for improved facilities, they became more receptive to what had previously been deemed unnecessary refinements that had no place in practical railroading.

Among other objectives that have come to the front in the development of water supply is the delivery of the water to the locomotives in such a way as to impose the least delay on train operation. But this and other considerations are so inter-related with developments in water service equipment and improvements in train operation, that one advance has almost invariably pointed the way to another. As a case in point, the success attending the introduction of water softening processes on a modest scale led both to the extension of treatment over greater territories and to the refinement of processes so as to obtain much lower residual hardness. Again, the improved performance made possible by a better quality of water led to longer locomotive runs, and these in turn produced a demand for uniformity in the quality of water throughout the extent of such runs.

Relocation of Water Stations

As soon as railway officers realized that it was economically possible to deliver water to trains at passing tracks on the tops of the hills, instead of in the sags at the stream crossings (near the source of the water), there was an awakening to the operating advantage of spacing water facilities to suit transportation needs rather than as dictated by the location of the supplies most economically available. Obviously, it was but one step further to the large capacity cisterns for locomotive tenders, the wider spacing of stations, and larger storage capacities, as well as water columns and supply lines capable of discharging the required quantity of water with a minimum of delay.

Running parallel with these objectives there has been

the constant incentive for lower delivery costs. This has given rise to the installation of more efficient pumps, and the substitution of internal combustion engines for steam power, these being later supplanted, in many cases, by electric power. These changes were made in part to gain the advantage of the superior efficiency of the newer types of power, but for the most part to reduce the cost of attendance, which in the case of the automatic or remotely-controlled electric pumping unit is practically nil. Improvements have been made, also, in the design of such auxiliary facilities as the valves, suction intakes, tanks, etc., while pipe lines have been replaced with new ones of larger diameter to reduce the friction head, and with it, the cost of pumping.

Thus, it is seen that the objectives of these various improvements embrace higher efficiency of train operation, lower cost of water supplied, better locomotive performance and lower boiler, firebox and flue maintenance. The capacity of water supply facilities is now entirely of secondary consideration, except as it concerns the requirements of individual plants. As a consequence, the prospect of only a limited increase in the *normal* volume of railway traffic in the future has no particular significance in considering the need for the resumption of water supply improvement work.

Work Is by No Means Complete

That the improvement programs that were suspended in 1929 and 1930 are by no means complete is evident from the fact that there are still many water stations that have not yet been modernized. On one road only 17 out of 142 plants are operated by electric power. Another road still has 129 steam plants, compared with 55 oil or gasoline-engine plants, and 30 automatic electric plants. Still another road has as yet converted only 16 steam plants to oil engine operation and 20 plants from operation by internal-combustion engines to the use of electric motors. These illustrations are believed to be typical of the railways as a whole, for all three of these roads have done their share of the improvement work in the past.

Programs for water supply improvements have been conducted on a progressive schedule, predicated to a considerable part on the physical condition of existing plants. In other words, modern plants have been installed as old ones have reached a condition demanding heavy repairs or replacements. Further than this, some of the objectives for improvements are of relatively recent inception, as for example, the demand for a respacing of stations to meet the requirements of large-capacity tenders. Other projects have their inception in a progressive advance in the art, such as the gradual refinement in water treatment practice. In the case of electrically-operated units, not a few projects have had to wait the establishment of favorable power rates or the extension of central station distributing lines.

However, even more conclusive evidence of the fact that improvement of water service facilities must go on is to be found in the testimony of railway officers in response to a questionnaire inquiring specifically as to the status of water supply programs. Of all the replies received, only 13 per cent manifested the conviction that no major improvement work remained to be done, while 69 per cent reported that their improvement programs had been left unfinished by enforced retrenchment in capital expenditures. Furthermore, several of the answers voiced the opinion that changes in requirements and advances in the art will always give rise to demands for the replacement or remodeling of facilities as funds become available.

Further evidence of the importance of water supply improvements is to be found in the fact that the net capital expenditures of the Class I railroads for water service plants in 1931, the second year of the depression, amounted to $5,070,286, which amount is only slightly under the average capital outlay in the years 1925 to 1929, inclusive, namely, $5,375,636, whereas the charge to capital account for all improvements and additions to all fixed properties in 1931 was only 29 per cent of the average for the five years ending with December 31, 1929.

In conclusion, the restoration of traffic to a volume approaching pre-depression experience will give rise to the expenditures of about $15,000,000 annually for the improvement and upkeep of the water supply facilities, and in addition, it will be necessary to provide for deficiencies in maintenance to the extent of about $12,000,000.

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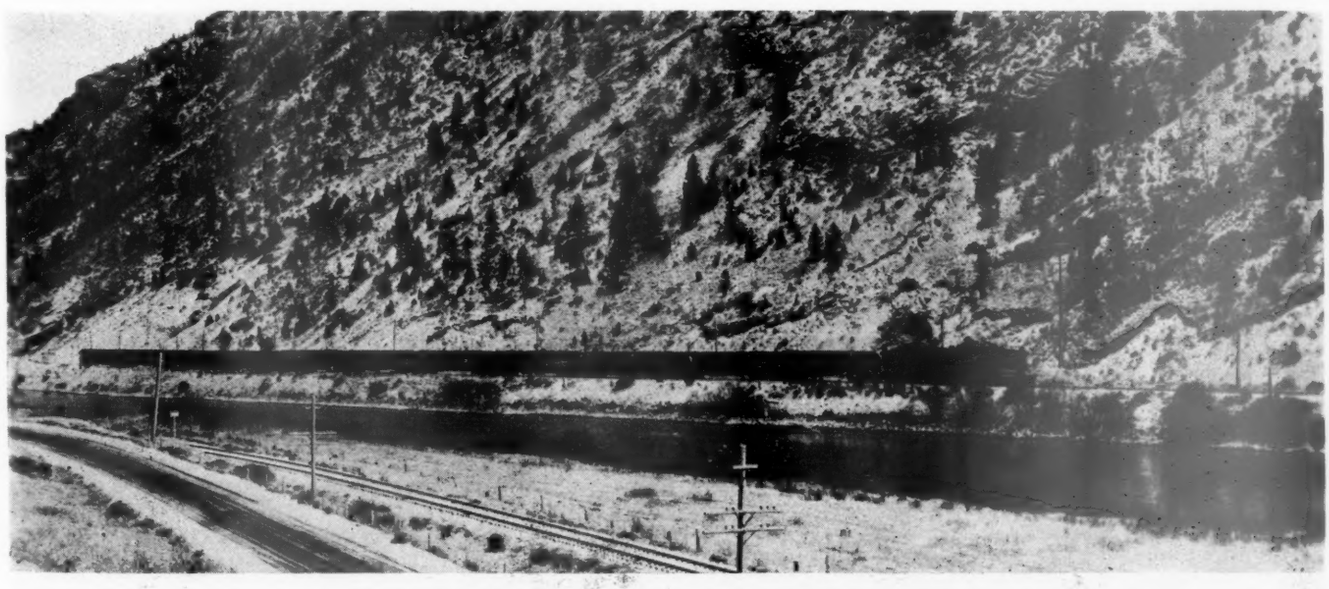


The Chicago, Milwaukee, St. Paul & Pacific's "Olympian" in the Electrified District

Attacking the Terminal Problem

High speeds of road freight trains largely offset by switching and delivery delays—New facilities and methods essential

TO what extent do railway terminal facilities and the manner in which those facilities are used stand in the way of maximum profit from traffic which railways are now handling and of the recovery of traffic which the railways have lost to competitors? How can railway terminal facilities be improved and their use be made more efficient, in order that the handling of freight in terminals will be less expensive in both time and money? Accelerating the movement of freight over the road is recognized as an important part of the job that must be done by the railways in the modernization of their service to meet the new transportation requirements of shippers. How much more important the speeding up of terminal operations is, is indicated by the fact that loaded freight cars spend three hours in terminals for each hour that they spend moving toward their destination on the road. In some respects, particularly with relation to merchandise and other traffic for which highway carriers are competing, terminal operations are too expensive and too time-consuming to fit into the picture of railway transportation as it should and must be.

The railways have been and still are pre-eminent in the movement of large quantities of bulk freight. It is that freight for which their facilities and their methods are best adapted. But even in connection with this backbone of railway freight traffic, there is a serious question. Can the railways so improve their terminal facilities for the handling of freight moving in considerable quantities that they will earn a greater return than they have ever earned before from this type of business, largely free from outside competition? This may be necessary if the railways are to be able to afford to do what is necessary to recover other freight that has been lost to competitors.

What is the principal source of expense in the movement of carload or bulk freight, other than that incident to the handling of the business over the line? Obviously, it is the classification of the cars. This expense is especially marked where this freight has to be classified not only at the originating and destination terminals, but also at intermediate terminals. Elimination of the necessity for repeated classification, where this is possible, is most desirable, but doing such classification as has to be done in the quickest and most inexpensive way is likewise required.

The installation of hump yards equipped with car retarders has reduced the expense in time and money required for the classification of cars on numerous roads. These are ordinarily to be found as yet only at the largest terminals, although some roads have accomplished worth-while results by the installation of hump yards at smaller points and by the use of one-way humps for two-way movements. On one road, the New Haven, consolidation of terminals and the general installation of hump yards, some equipped with car retarders, has enabled a 35 per cent increase in gross ton-miles to be handled with 24 per cent fewer freight yard engine hours.

Further adoption of the "main tracker" type of operation, which eliminates the necessity for repeated classification and facilitates operations on the line, is needed for the sake of speed and economy in the movement of all kinds of freight. The "main tracker" has proved its efficiency on a number of roads, but there is still room for more general application of its principle. To this end, close study will have to be given to the relocation and redesign of yard facilities.

Modernization of yard operations is an essential step in the speeding up of the railways' freight service and in the rehabilitation of railway earnings. Substantial progress along this line was being made up to the time when depression put a stop to capital expenditures, but in many cases yard equipment and yard operating methods in use still represent little, if any, change from those to be found years ago. The equipment necessary for the moderniza-

Classification Operations, Expensive at Best, Can Be Accomplished More Quickly and Economically in Retarder-Equipped Hump Yards

The Freight House Will Impede the Rapid Handling of Large Volumes of Freight If It Is Not Properly Equipped

tion of yard operations is available and its effectiveness has been proved by experience. Recovery in industry and resultant increases in railway earnings justify an immediate resumption by the railways of the yard improvement program which they previously had under way.

The terminal problem is even more pressing with respect to the handling of merchandise and other kinds of freight for which competitors are making strong bids. Here the necessity is not only for the utmost economy, but also the utmost expedition in handling. Economy is essential because rates on competitive freight are being forced down. Speed is essential because railway competitors have set new high standards for speed in the transportation of many kinds of freight.

Present competitive conditions may require the reconstruction, relocation and, perhaps to a large extent, the replacement of terminal facilities used in the handling of merchandise and other competitive freight. If new methods cannot effect the much speedier movement of freight through terminals with the old facilities, then those old facilities must be supplanted by new ones. Some means must be found whereby the movement of freight between the door of the shipper and the outbound track of the railway and between the receiving track and the door of the consignee can be accomplished with an economy and a rapidity more in tune with the economy and speed with which railways are moving their traffic over the road.

The freight house, through which moves the railways' still substantial volume of l.c.l. traffic, is a point where attention is especially demanded at the present time. Truck competition has introduced shippers to new transportation schedules which feature pick-ups late in the day and deliveries early in the morning. Railways which have attempted to meet this service with similar schedules and with railway-furnished pick-up and delivery have been confronted with the task of handling successfully large volumes of traffic in two very distinct peak periods, one in the late afternoon at the receiving platform, and the other early in the morning at the delivery platform. Many outbound freight houses are finding that 70 per cent or more of the freight which they receive now comes to them after 4 p. m. Naturally, this imposes a severe load upon the freight handling organization which must, if schedules are to be met, transfer this freight to outbound cars in time for their forwarding in night trains. Failure of the freight house forces to load the outbound freight in time means missed connections, a lay-over of from several hours to a full day for the freight and the failure of the railway to provide the quick delivery demanded by its shippers.

The railways which are most successfully meeting this situation are those which have taken full advantage of the efficiency and capacity available in modern freight house equipment, after study of the situation to see that the equipment meets operating requirements both as to the type of lading to be handled and as to the physical characteristics of the house itself. The ability of mechanical freight house equipment to handle large volumes of freight quickly and economically has been demonstrated conclusively in the stations of many railways which have given thorough consideration to methods of its operation. Flexibility of the sort necessary in the successful accomplishment of the movement of freight which comes alternately in dribbles and in large volume is the outstanding characteristic of modern platform equipment. With it one railway found that the freight handling operations in a new station could be taken care of by 35 gangs of 3 men each, while if hand trucking had been employed, 40 gangs of 7 men each would have been required to do the same work. Used now in many freight houses, equipment of this sort will have to be supplied on a much broader basis if freight houses are to be used to their fullest capacity and are to be kept from interposing a barrier to the rapid movement of l.c.l. freight.

The largest field for improvement of the terminal operations of the railways, however, may well lie in the relocation of terminal facilities, both yards and stations, used in the handling of l.c.l. freight. The complicated switching necessary in the movement of trap cars between shippers and receiving stations and between receiving stations and classification yards is a source of lost time and considerable expense. The maintenance of numerous freight stations and of the hundreds of cars and dozens of switch engines necessary to serve these stations, is inordinately costly, and the fact that movements to and from these stations and sidings must be made on a few congested tracks is the cause of substantial delays.

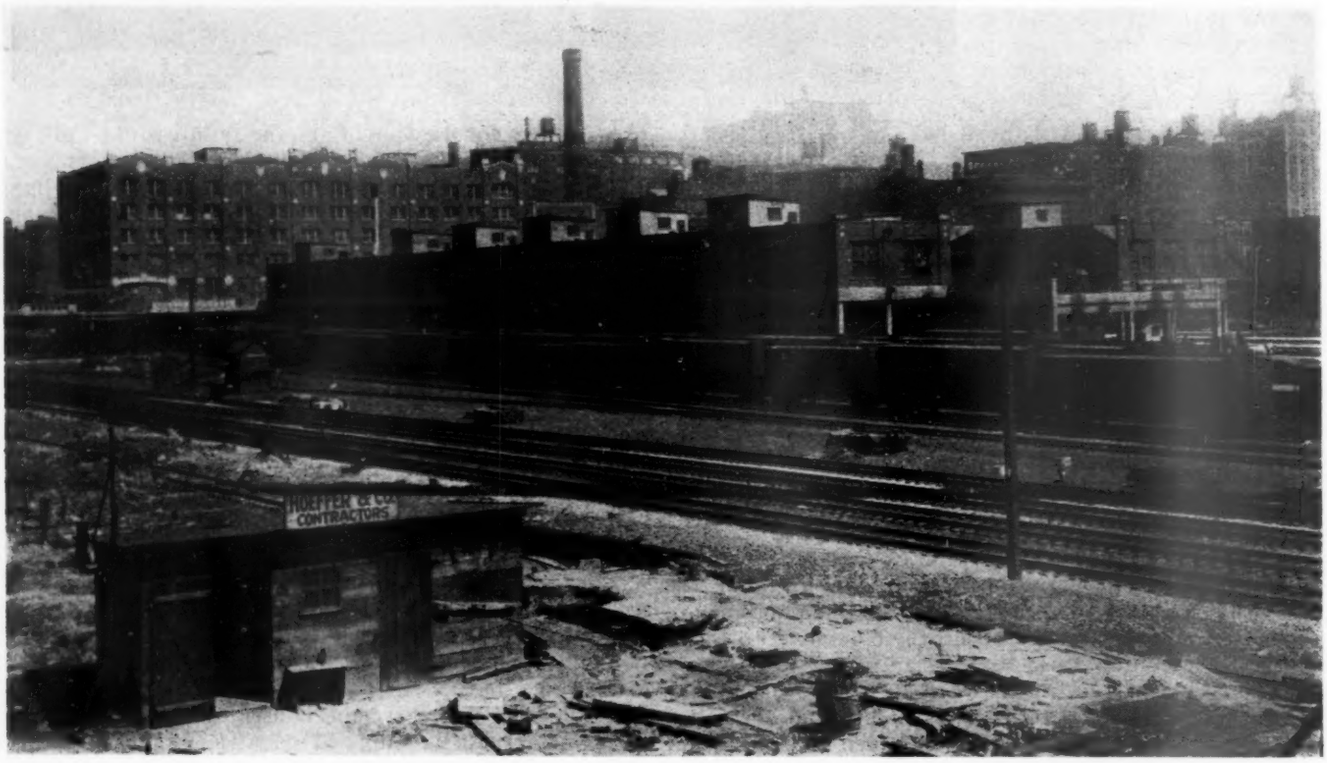
The motor truck appears to be the logical means of eliminating much of the expense and delay now caused by adherence to the rails in terminal movements. The use of motor trucks in replacement of trap-car and transfer service has been adopted successfully by a number of roads, as described in another article in this issue, but this solves only part of the problem. There remains the necessity of eliminating delays between the

time when the truck or trap car discharges its cargo and the arrival of the freight at its destination.

The Chicago & North Western's Proviso yard, 13 miles west of Chicago, represents the effort of this railway to solve one of its Chicago terminal problems. Before the transfer was placed in service, cars were received and dispatched at each of 26 stations in the Chicago territory, and these cars, in many instances, were not fully loaded, resulting in their movement under light load and requiring frequent rehandling of the freight. The establishment of the l.c.l. freight transfer at Proviso, however, has made it possible for the North Western to consolidate the loading and classification of outbound cars for the entire system at one point, all outbound l.c.l. freight from the 26 stations being handled by freight car or by motor truck directly to Proviso for loading into outbound cars. The result has been substantial acceleration of the movement of freight from Chicago and the adjacent territory; the saving of between 100 and 150 cars per day in the equipment required to handle business from the various stations, due to the concentrated and heavier loading of the outbound cars; reduction of classification requirements both in the Chicago territory and at outlying yards on the system; reduction of loss and damage claims; lower handling costs; substantial reduction of way-freight overtime payments; and simplification of operations in the receiving yards at destination.

The use of trains for the line-haul service and of trucks for the terminal service in the handling of merchandise traffic is the direction in which railways have been steadily moving for some time. This has come about largely as a result of railways' meeting the increasingly insistent demands of shippers for pick-up and delivery service as a part of railway operation. General adoption of pick-up and delivery service for l.c.l. freight will enable, if it does not require, marked changes in the methods which have been employed in the terminal handling of this class of business. To what extent it will make possible the elimination of switching, relief of terminal congestion and partial abandonment of expensive terminals in industrial and commercial districts, remains to be seen, but it appears that there is a substantial opportunity here for reducing terminal expenses while improving the service rendered to shippers. Store-door collection and delivery, as it has been adopted thus far, has been largely superimposed upon ordinary railway facilities and operating methods, but it is to be expected that pick-up and delivery service will make possible changes in the railroad set-up for l.c.l. which will go a long way, if not the whole way, toward making up the extra cost of the additional service.

As to the large, centrally-located stations which the railways now use in the principal cities which they serve, some means should be found whereby they can be operated on a profitable basis. Many of them have never been used anywhere near to capacity, and the prospects for such use in the future are doubtful. Perhaps these stations can be made to serve effectively as consolidation and distribution centers in connection with pick-up and delivery service, but if this should develop, many alterations will undoubtedly be required to adapt them to use with the new types of rail-highway co-ordinating equipment which are now being developed. The big station is a problem which must be attacked vigorously and without too frequent backward looks.



Centrally-Located Freight Stations Are a Source of Great Expense, Too Often Unjustified by the Extent of Their Use

The railways cannot afford to waste time and money in the operation of their terminals. Competitive freight which cannot be handled through terminals without delay is freight which railway competitors, not the railways, will handle. Modernization of the railways' terminal facilities and the installation of equipment required in the expeditious and economical handling of freight through terminals is a vital part of the program of railway rehabilitation, which promises a more than proportionate contribution to rehabilitation of railway earnings.

Motor Coaches, Co-ordinated with Trains as on the Texas & Pacific, Vastly Improve Local Passenger Service

A Place for Trucks and Buses

Motor vehicles, co-ordinated with railway service, can play important role in improvement of service to meet new conditions

MOTOR trucks and motor buses, responsible for the loss of millions of dollars in railway freight and passenger revenues during the past decade, offer the obvious means by which at least a large part of those revenues can be restored to the railways. The new traffic conditions and the new transportation conditions, which have made so essential the improvement of railway freight and passenger transportation, can be met, in many instances, by railway use of the types of vehicles which largely created them. To some extent, it is a case of fighting fire with fire. To a greater extent, it is a case of fighting bus and truck transportation with something still better—co-ordinated railway and highway transportation.

Deferred maintenance is not the reason for the failure of the railways to meet their competition more successfully. Rather, the reason lies in deferred buying of the kinds of equipment—of which motor trucks and motor buses are an outstanding example—with which competition can be met. Most railways now recognize and have recognized for some time that the co-ordination by them of railway and highway transportation is essential if the railways are to recover the traffic which they cannot afford to do without, and if they are to provide the best transportation service of which they are capable and which shippers and travelers are so urgently demanding.

Deferred Buying of Motor Vehicles

They have deferred the purchase of the vehicles with which to carry out this co-ordination just as they have deferred the maintenance of railway equipment which they already own. The end of the period of deferred maintenance of railroad equipment should also be the end of the period of deferred buying of such needed equipment as motor trucks and motor buses. Otherwise, it appears inevitable that competition at the expense of the railways will continue to flourish and the rehabilitation of railway earnings will be still longer deferred.

Utilizing Motor Transport

Specifically, how can motor transport be utilized by the railways to so improve their service as to place it on a par with that of their competitors? The case of the motor bus in co-ordination with train service is especially clean-cut. The motor bus is a most obvious means of rehabilitating the passenger service of the railways in branch line territory and in local service along main lines. What is the situation today? Compelled in recent years to effect every possible economy, the railways have abandoned all passenger service on hundreds of branch lines and have greatly reduced the local passenger service on other branch lines and on many light-traffic main lines. As a result, the passenger service of the railways in all except the most thickly settled parts of the country is a mere skeleton. The limited trains are left, but more than one round trip per day by a local train on a great many lines is the exception rather than the rule.

For example, consider the local passenger train service now offered by a leading middle western railway. At one time, this company was noted for the volume of passenger traffic which it handled, a large part of which was business fed to its main lines by numerous branches. Today, the passenger traffic handled is a small fraction of that which once rode this railway's trains. Perhaps this is one reason for the decline: While maintaining a fairly good frequency of service on its main lines, this consists largely of through trains; many stations even on these lines are without passenger service, no provision being made even for flag stops of the trains left in service. On the branch lines of this railway the passenger service is at or near

the absolute minimum in almost every case. Five of the branch lines enjoy a passenger service consisting of two round trips per day. Twenty-five of the branch lines see a passenger train twice a day—one up and one down. Mixed trains operated on one daily round-trip schedule are the only inducement to passenger traffic which this railway offers on 11 branch lines. On 13 branch lines, passenger trains are operated in each direction only three times a week, while on 3 branch lines only two round trips per week are operated. The train service was reduced on this railway, of course, because passengers were won away from the trains by automobile and bus transportation. But is it not conceivable that many of the passengers would return to the railway if the railway were to provide a frequent, comfortable service, as inexpensive to use as that of the competitive bus lines and considerably less expensive than travel in automobiles, all costs considered?

No Service, No Passengers

The railways cannot hope, even by reducing their basic passenger fares, to develop traffic on lines where there is nothing for the passengers to ride in. Service needs to be provided even on these branch lines because the passenger who is compelled to use his own automobile from his home is unlikely to abandon his car at the junction in order to board a main line train. Granting the need for the rehabilitation of the railways' local passenger service, how can this be provided?

The motor coach offers a convenient means of providing such service, handling a small volume of traffic at slight expense. Motor coaches with capacities ranging from 12 to 40 passengers have been operated at costs ranging from as low as 15 cents a mile up to 30 cents a mile, depending upon the territory traversed. Motor buses are economical because they are small, compared with a passenger train, and because they are operated by a crew consisting of one man. Their economy is such that five or more round trips per day can be operated over a route at no greater cost than that involved in operating one train over the same route.

A number of railways have attempted to test the traffic-producing qualities of motor coaches when operated in replacement of branch line train service. Ordinarily, the buses have failed to produce the wanted increase in business. But these tests have not been conclusive. In every instance, economy has been the major goal, and the frequency of service justified by the small cost of motor coach operation usually has not been provided. Furthermore, fares in general have been maintained at the railroad level, higher than that of most competitive buses and too high to make them attractive in comparison with the cost of automobile transportation.

If frequency of service is a means of developing traffic—and many commercial travelers point to lack of frequency of service as the reason why they do not travel by railroad—then it needs to be utilized by the railways. The motor coach, inexpensive in the extreme, affords a means whereby such frequency can be provided at small cost. Its operation in fleets throughout the territory served by individual railways is an outstanding means by which they can rehabilitate their passenger service to meet the new conditions in transportation brought about by the existence of the railways' highway competitors.

The motor coach has a place, too, as a means of conveying passengers beyond the rail head to points closer to their destination. The motor coaches in competitive hands and, even more, the private automobiles, do not require passengers to come to one particular station in the city in order to board them. They carry transportation closer to the homes, offices or hotels of travelers. The railways can do this, too, by the operation of motor coaches from their metropolitan stations to conveniently located off-line stations and stopping places. The Baltimore & Ohio is doing this in New York and Brooklyn with results characterized by the management as favorable.

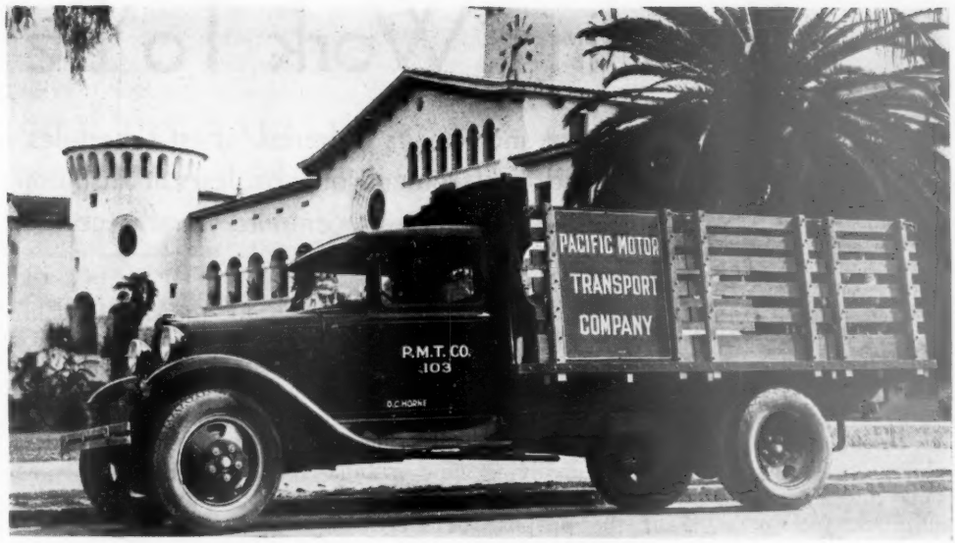
Places for the Motor Truck

The motor truck can play a part in the rehabilitation of the railways' freight service similar to that which the motor coach can play in the rehabilitation of the railways' passenger service. A small, flexible, inexpensive medium of freight transportation, the motor truck can go where it is impossible or too expensive for the freight train to go. The motor truck can short-cut railway lines in many cases, and, co-ordinated with train service, can enable the railways to offer to shippers the same fast, convenient service which competitive trucks now offer.

The most effective use of the motor truck by railways is in connection with terminal operation. Foremost is the ability of the motor truck to complete the job of freight transportation, of which the railroad performs only the middle part. That is, the motor truck can provide the pick-up at the door of the shipper, the transfer to the railway station, the transfer from the railway station at destination and the delivery of the freight at the door of the consignee. There is general agreement that the provision by the railways of store-door collection and delivery service is essential if they are to make headway against competitive truck transportation. This has been found true by experience on many roads in this country and in foreign countries.

The general establishment of pick-up and delivery service for l.c.l. freight would involve the use of many thousands of pieces of truck equipment. The expense

"Accept Today—Deliver Tomorrow" Is the Freight Service Slogan of the New Haven, Which Makes Good by Co-ordinating Train and Truck Service



Better Business Has Resulted from the Southern Pacific's Provision of Complete Freight Service, by Means of Trains and Pick-up and Delivery Motor Trucks .

would be enormous, yet there is no other known means whereby an equally marked improvement in railway freight service can be effected. During the period of tight money, many railways have adopted the expedient of contracting with local draymen for the truck service necessary to perform their pick-up and delivery work. This is at best, however, only an expedient, and not the most economical way of performing the service. Railways which have purchased their own truck equipment and compared its cost with the cost of contracting for truck service have found that the former is 20 per cent or more cheaper than the latter.

Storedoor Service Recovers Traffic

Shippers generally have expressed satisfaction with the pick-up and delivery service provided by railways which have pioneered in this improvement of railway freight transportation. They have expressed their approval in concrete form by routing their freight once more by rail instead of by competitive motor truck. No doubt is left, therefore, that the provision of pick-up and delivery service is a prime necessity in the program of rehabilitating the railways' freight service, and in this work the motor truck has the field to itself. The provision of truck service for pick-up and delivery is essential. Ownership of the trucks so used is advisable from the standpoint of economy.

The motor truck, experience has shown, is likewise a useful instrument in the replacement of various types of train operation in both terminal and line service. To a large extent, economy has been the principal purpose of the Boston & Maine, the New York, New Haven & Hartford, the New York Central, the Pennsylvania and other roads which have substituted motor trucks for local freight trains and for transfer movement by freight cars in terminals. Economy is not the only benefit which has been derived from these substitutions, however. Improvements in the service rendered to shippers have been general. Full days in the time required to forward freight to its destination are commonly saved by these train-replacement trucks. In terminals, they transfer freight by the shortest possible route between one station and another, avoiding the frequently circuitous and always time-consuming switching movements necessary in the transfer of freight by freight cars. In line operation, trucks radiate from concentration points to which freight is brought or from which freight is taken by train, speeding up the schedules of such trains by eliminating the necessity of local stops and completing within a few hours the movement of freight between local stations and concentration points which, in many cases, requires a full day or more by all-rail operation.

New Methods of Freight Transportation

Finally, there is a place for the motor truck, although it has not yet been clearly defined, in almost completely revising all terminal operations of the railways. It has been found that for every hour that a loaded freight car spends on the road, it spends three hours being switched in terminals. A large proportion of the time required for the movement of the average shipment of freight from the shipper to the consignee, therefore, is consumed within terminals, nullifying to a serious extent the high speed in over-the-road movement which freight trains commonly provide today. Likewise, a large proportion of the expense of moving freight by rail is incurred within the terminal, the average cost having been determined at $25.40 for both originating and destination terminals. To overcome this condition, it has been repeatedly suggested that old methods of handling freight in terminals should give way to new practices, in connection with which motor trucks would play an important part. As the new system is visualized, only that freight moving in large bulk would be handled entirely by rail from shipper to consignee. All other freight would be handled by rail only between stations lying outside the congested areas of the cities of origin and destination. Between the door of the shipper and the platform of the outlying station at the point of origin, and between the station platform and the door of the consignee at the point of destination, all freight would move by motor truck, probably in some form of freight container to reduce or eliminate intermediate handling.

As yet, operation of this sort has not been attempted on a substantial scale by any railroad in this country, although certain of its elements have been tried with success by freight forwarding companies and by railways which have placed trucks in one kind or another of terminal service. Although admittedly the adoption of this plan of terminal operation would involve revolutionary changes in methods, the benefits expected to be derived from it are believed to justify the extreme nature of the changes. Under present methods of operation, the motor truck is highly adaptable for use in providing pick-up and delivery service and in sub-

(*Continued on page 628*)

Signaling Work To Be Done

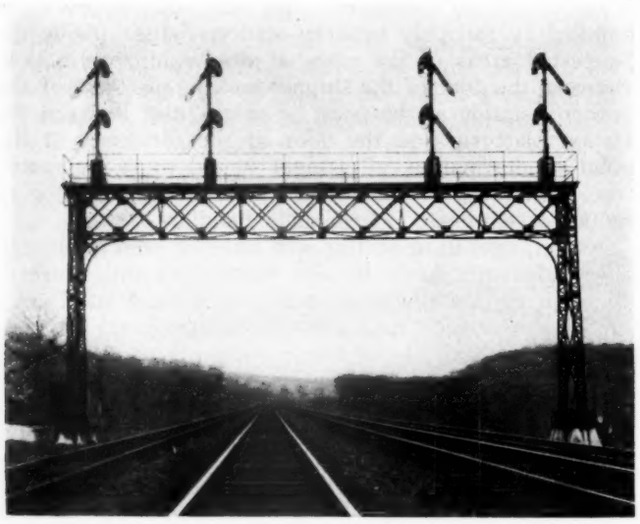
Maintenance and repairs deferred—Fast schedules necessitate rapid replacement of obsolescent equipment and extension of centralized traffic control

TO restore the signaling facilities to the 1929 standard of maintenance, the railways should spend approximately $20,000,000; to reconstruct and combine existing facilities to secure maximum efficiency and reduce operating expenses will warrant the expenditure of $10,000,000 annually for the next few years at least; while self-liquidating projects, involving new installations of centralized traffic control, car retarders and automatic interlocking, for the purpose of increasing average train speeds, will justify an expenditure of $20,000,000 annually for the next several years.

The Maintenance Deficiency

Comparing 1932 with 1929, expenditures for the maintenance of signaling facilities have been reduced approximately 50 per cent. Here the situation is entirely different from that prevailing with cars and locomotives, which can be taken out of service and stored during periods of light traffic, whereas automatic signaling and interlockers must at all times be so maintained as to render safe and satisfactory service in order that such trains as are left may be operated efficiently. It is true that some 200 small interlockings have been taken out of service temporarily, as have also a few sections of automatic signals, totaling not more than approximately 1,000 miles, but the amount of all signaling out of service probably represents less than 2 per cent of the total.

In 1929 the Class I roads spent $35,140,858 for materials and labor for the maintenance of signals and interlockers, while for the six-year period from 1924 to 1929 inclusive, the average annual expenditure for this item was $32,281,366. In 1931, this expense dropped to $25,277,833, and in 1932 to $16,771,739, the latter figure being 48 per cent less than the six-year average mentioned above. Since even with the reduced traffic the signal facilities should have been maintained on at least an 80 per cent of normal basis, the deferred maintenance, which has accumulated since January 1, 1931, totals approximately $25,000,000 for materials and labor. These figures do not include the amounts expended for the operation of signaling facilities, which are chargeable to transportation. These latter charges normally total more than $25,000,000 annually, although in 1932 they were reduced to $18,420,000.



Semaphores Like These Can Be Replaced with Light Signals in Many Instances with Resulting Economy in Operation and Maintenance

Wages and hours worked afford other measures of the reduction in expenditures for the maintenance of signaling. In 1929 the Class I roads employed an average of 16,954 signal maintainers, helpers and assistants, the average number of man-hours paid for monthly being 3,694,869, and the total wages for each month averaging $2,546,813. Starting in 1930, the number of positions was reduced by extending territories and eliminating some of the helpers and assistants, until the average number of employees of the classes mentioned declined to 10,487 in 1932, and to about 9,700 during the first six months of 1933, with a minimum of about 9,300 in April. Furthermore, the reducing of the number of men and the shortening of the working week, in some cases to five days or less, reduced the number of man-hours paid for each month from 3,694,869 during 1929 to about 1,430,000 monthly during the first six months of 1933. In other words, in 1929 each man worked an average of 212 hours each month, whereas, in 1933, as a result of the shortened week, each man worked an average of only about 148 hours each month. The average monthly expenditure for wages to employees in the classes named was $2,546,813 during 1929; $1,344,694 in 1932; and approximately $1,225,000 during the first six months of 1933.

Recapitulating, a comparison of the figures for 1929 and 1933 shows a reduction of 48 per cent in the monthly expenditures for maintenance, a reduction of 61 per cent in the hours worked per month, and a reduction of about 52 per cent in the expenditure for wages. That these expenditures have been reduced approximately 50 per cent in spite of the fact that practically 98 per cent of the equipment has been retained in service, means that some of these facilities must necessarily have been neglected to some extent.

A considerable proportion of the savings have been effected by deferring painting and normal repairs. Wearing parts, such as cranks and pins, have been left in service until worn beyond the limits ordinarily permitted. Insulated wires and cables, especially those run underground, have passed their normal life. Storage batteries have been "marathoned" to the limit. Lightning arrestors, rail bonds and other accessories have been neglected until they are in need of extensive replacements.

The reduction in the number of maintainers and in the hours worked has been effected not only by practically eliminating repairs and replacements, but also

by a curtailment of inspections normally made for the purpose of detecting defects before they cause failures. As it is, the maintainers on many roads are now, in effect, primarily "trouble shooters." Of course, the fundamental principle of the design of all signaling apparatus is that a failure of any part or circuit should result in the signal displaying its most restrictive indication. However, these failures result in unnecessary train delays, which, if too numerous, cannot be tolerated under present competitive schedules. The fact that comparatively satisfactory service has been rendered by signaling facilities during the past year indicates the excellent condition of such equipment before curtailments were started three years ago. However, the "elastic limit" will become evident inevitably when failures increase, which will no doubt be the experience on many roads when the number of trains increases.

Obsolescence a Factor

The worn and exhausted condition of the signaling facilities which has been brought about by the curtailment of maintenance during the last four years presents an opportunity to the railroads. From an economic standpoint, a large percentage of this equipment should not be rehabilitated, but should be scrapped and replaced with modern apparatus, which, in most cases, will reduce operating costs sufficiently to pay for the improvement within a few years. Take, for example, a semaphore signal with an electric lamp, which can be replaced with a color-light signal requiring but little more electrical energy than previously required by the semaphore lamp alone. The saving in energy, together with other economies effected, will soon pay for the new signal, and as a by-product, the railroad will have modern equipment which will afford improved signal indications. Likewise, a modern track relay not only affords safer shunting protection, but consumes only about two-thirds as much battery as a relay made 10 to 15 years ago. It is, therefore, quite evident that it is folly to spend $5 to rebuild an old relay when $15 more will buy a new one which will save enough battery to pay for the increased expenditure within five or six years.

Also, further increases in train speeds will require longer braking distances, which will introduce problems from the signaling standpoint. In order to utilize the tracks efficiently, signals will have to be respaced and four-block aspects introduced, which means that the automatic signaling will have to be entirely reconstructed. When this is done, it is logical that practically all of the old signal apparatus should also be replaced with modern equipment.

Mechanical interlocking, as a type, is obsolete, and many existing plants are obsolete from an operating standpoint. This is illustrated at Dayton, Ohio, where the Dayton Union Railway installed a centralized-control type of electric interlocking which not only combines the functions previously handled by five separate mechanical interlockings and four sets of switch tenders, but also facilitates train movements by directing trains by signal indication throughout the entire area without delays of the kind that were formerly occasioned by train orders or communication between towers. The same idea applies to the consolidation of the control of two or more adjacent interlockings.

Furthermore, a large percentage of the mechanical interlockings in service at outlying crossings can be replaced by automatic interlockings with economy. As an example, at the Rock Island-Missouri Pacific crossing at Pleasant Hill, Mo., a mechanical interlocking was replaced by an automatic plant at a cost of $5,500, and

Many Outlying Mechanical Interlockings Can Be Replaced with Automatic Plants or Included in C.T.C. Systems, Eliminating Levermen

a net annual saving of $4,500 was effected in operating expenses—a return of 82 per cent on the expenditure. Again, at crossings where no protection was previously afforded and all trains were required to stop, the saving effected by automatic interlocking depends on the number of train stops eliminated. At Marion, Kan., on the Santa Fe, an automatic interlocking was installed at a cost of $8,703, with a resulting net annual saving of $15,088, based on an average of $2 saved for each of about 8,000 train stops eliminated annually.

New Systems of Operation

Beyond the replacement of obsolete signaling equipment in kind, and the consolidation of controls for layouts, the signal field offers three comparatively new systems which also deserve consideration, i.e., cab signaling with or without train control, centralized traffic control, and car-retarders. On important lines handling heavy high-speed passenger traffic, train control and/or continuous cab signaling affords the most complete protection, and in addition expedites train movements, especially during fogs and stormy weather, an important factor in maintaining schedules. It is logical that this additional protection should be installed on a considerable mileage of heavy traffic lines during the next few years.

The immediate problem of greatest importance in train operation is to secure higher average train speeds, and the easiest way to accomplish this result with the present equipment and trackage is to reduce the delays occasioned by meeting and passing trains under the train-order system. The direction of train movements by signal indication, superseding train orders and rights, permits the dispatcher to utilize available trackage to meet immediate circumstances, thus keeping the train moving. Such a system is the basis of modern centralized traffic control, by means of which the switches of passing tracks, junctions and ends-of-double-track, together with the signals for directing train movements over an entire division, may be controlled from one point, the system including an automatic OS record of all train movements.

Postponement of Expenditure for Additional Tracks

One very definite saving, made possible through centralized traffic control, is the deferment of large expenditures for additional track facilities. On lines where the volume of traffic exceeds the economic ca-

As Many as 90 Per Cent of the Train Meets Are Non-Stop on Certain C.T.C. Single-Track Installations

pacity, that is, where excessive delays are encountered in moving the business over the road, overtime becomes a large item of expense, and many block offices are required. In some cases, peak traffic movements cause congestion just at the time when prompt delivery is of most importance. On many such divisions, the physical conditions are such that the addition of another track would necessitate heavy expenditures. Centralized traffic control now offers a most effective solution for such a problem, at a moderate outlay.

On the Southern Pacific, for example, where a peak movement of fruit and vegetables is handled over a 40-mile section of line in California, the installation of centralized control has afforded so much relief, in the way of improved operation and increased track capacity, that a $2,500,000 second-tracking program has been deferred indefinitely. Likewise, the New York Central has indefinitely postponed an estimated expenditure of $2,000,000 for 40 miles of second track, by the installation of centralized traffic control. Still another large road has plans for increasing the capacity of a single-track line, and thereby deferring second track construction, by relocating passing sidings on a time-distance basis and installing power-operated switch machines or spring switches at each turnout, and directing all train movements by signal indication controlled from a central point.

Down the Hump Without a Rider and With No Switchmen Required in a Car-Retarder Yard

The use of automatic signaling and centralized traffic control for directing train movements has so increased the capacity of single track that it is not only possible to defer the construction of second track, but in some cases sections of second track are being removed, thus effecting savings in track maintenance of $1,000 or more per mile annually. For example, in 1932 the C. M. St. P. & P. abandoned nine sections of second track totaling 200 miles, converting the signaling for either direction operation on the single-track, and using spring switches or interlocking at the ends of double track.

Great possibilities likewise exist for the extensive application of centralized traffic control on multiple track lines for directing train movements in either direction on one or more tracks. Thus, by this means each track can be utilized to best advantage to meet the varying directions of traffic from one period of the day to another, the result being an increase in track capacity without constructing more tracks. As an example of such operation, the Boston & Maine has one installation extending from Fitchburg, Mass., to Hoosac Tunnel, which includes 54.5 miles of double track, on which trains are operated in either direction on each track with 3.1 miles of three-track line with either-direction operation on two tracks, and with 5.7 miles of three-track line with either-direction operation on one track.

The 40 major installations of centralized traffic control, which have now been in service for periods up to several years, have conclusively demonstrated the benefits that are derived. In brief, the savings effected in operating expenses range from 30 to 50 per cent or more on the investment and the average time saved ranges from 1.4 min. to 1.8 min. per freight-train mile. In other words, the average road time between terminals on a 100-mile run can be reduced approximately three hours. In this connection, it is important to add that the results to be obtained from a proposed installation of centralized traffic control can be forecast accurately by means of time-distance charts.

Car Retarders Reduce Yard Delays

The excellent train performance made possible by proper signaling on adequate main lines is oftentimes cancelled by delays in classification yards. As a remedy for this situation, car retarders can be installed to expedite the operation of these yards, which will at the same time effect economies sufficient to make the project self-liquidating.

Two outstanding features of a car-retarder yard are that the operating capacity is increased and that this maximum capacity is available at all times at minimum expense. This factor functions to advantage under different circumstances. At a large terminal, inbound traffic in the morning can be classified and delivered quickly to team tracks, freight houses or connections, without appreciable yard delays. At an intermediate terminal, trains can be classified on arrival without delays on receiving tracks. Furthermore, the increased capacity of a car retarder yard makes it possible to concentrate in one yard the classification formerly handled in several yards, or, as is being done in three cases,

both eastbound and westbound traffic can be classified over one hump.

In addition to facilitating operation, car retarders reduce operating expenses by eliminating car riders and switchmen, as well as reducing the number of yard engines required. In one yard the operating expenses were thus reduced $200,000 annually, which represented a return of 40 per cent on the investment for the retarder installation. With 2,750 cars handled daily, the yard operating costs were reduced from 43 cents to 18 cents per car. With 35 classification yards now equipped with retarders, adequate information is available to prove the desirability of providing such facilities in not only many of the larger hump yards, but also in smaller yards now operated with flat switching.

Conclusions

In order to make good the deferred maintenance of signaling facilities, approximately $10,000,000 should be spent annually for the next three years. Furthermore, a gross expenditure of at least $30,000,000 should be made annually for the modernization of automatic signaling, the combination of interlockings, the replacement of outlying plants with automatic interlockings, and the installation of cab signaling, remote control of switches, centralized traffic control, and car retarders, where warranted by the economies possible. The outstanding feature of such projects is that they offer an opportunity to contribute in two very essential ways to the ability of the railroads to meet new conditions and competition, i. e., by reducing operating expenses, and by speeding up schedules, with quicker deliveries. Data based on results being secured on existing installations prove that such facilities pay for themselves in from two to five years. Furthermore, in the majority of cases, a large proportion of the savings can be effected regardless of fluctuations in the volume of traffic and can, therefore, logically be authorized at the present time.

Electrical Requirements of Steam Roads

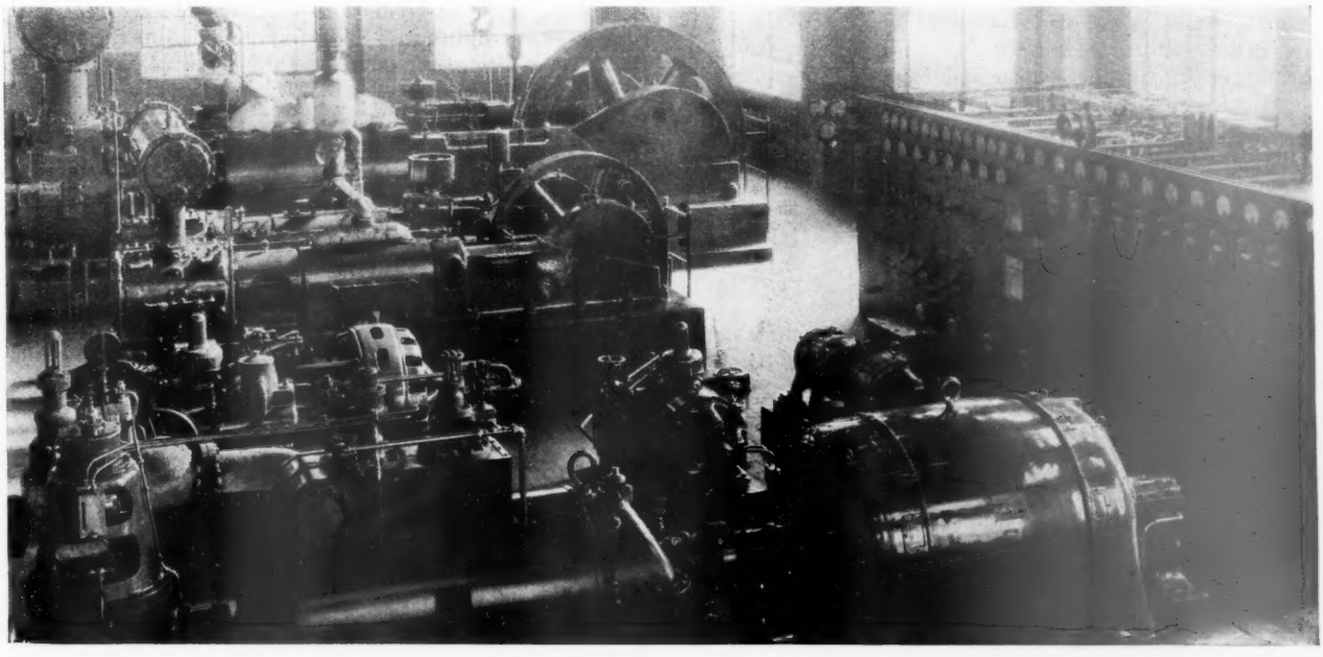
Electric power and apparatus are essentials of rehabilitation work in all railroad departments

BECAUSE of the peculiar position of the electrical department in most railroad organizations, the functions it must perform to meet the needs of deferred maintenance and economically urgent changes represent a cross-section of the needs of all of the other departments.

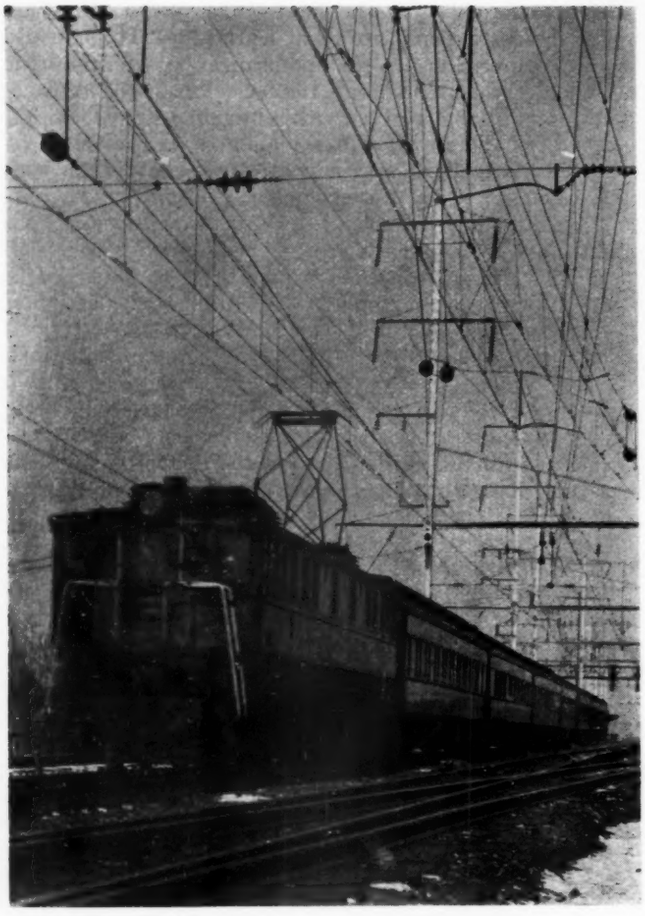
Electrical equipment is utilized in all departments, and ordinarily the electrical installation and maintenance work is performed, or at least co-ordinated, under the direction of the electrical engineer. The only exception to the rule that electrical requirements vary in proportion to the requirements of other departments occurs on roads having extensive electrified sections.

A survey indicates that electrical activities and electrical department personnel have been subjected to the same or a little greater repression than others; possibly greater because its functions are usually accessory, rather than primary. The efficiency of the workers is high because only the best remain, but there is also evidence that labor is often used in rather prodigal fashion to avoid the necessity of purchasing new material.

The magnitude and character of railroad electrical re-



Adequate, Dependable Electric Power Supply is Essential to the Operation of Railroad Facilities



The Largest Railroad Electrification in the Country is in Process of Completion

quirements are apparent from a review of the other articles in this issue, made with a realization of the great extent to which electrical equipment is used in all departments.

As is the case of other types of facilities and equipment, there has been an under-maintenance of electrical apparatus. This should be taken up, but in some instances it will be far better to install up-to-date apparatus, rather than to repair that which is obsolete. There are numerous instances, also, where new applications of electrical apparatus will pay for themselves in a reasonably short time—will, in effect, be self-liquidating. The remainder of this article will attempt to point out some of the more recent improvements in electrical apparatus, either in the interests of more efficient operation, or of improved service which will help to attract traffic back to the rails.

Shops

With the exception of electric traction, the most comprehensive use of electrical facilities occurs in the railroad car and locomotive repair shops. Beginning with the power plant or substation, where the power is respectively generated or purchased, it is distributed by an underground and overhead distribution system to practically every building on the property. The power is used essentially for lighting and the operation of motors; to a limited extent it is used for heat. In most cases both alternating and direct-current power are used, the former for convenience and simplicity of equipment, and the latter for the operation of cranes and machine tools requiring variable-speed drives. High-frequency a.c. power is finding highly successful application for the operation of portable tools.

In recent years many railroad power generating plants have been abandoned for purchased power, the small railroad plant being unable to compete on a cost basis with the highly developed public service systems. This process may be expected to continue, with the substitution of substations for generating plants, except at places where shop work is being concentrated in a relatively few large shops. In such locations, particularly in northern country, where there is a demand for low-pressure steam during a large part of the year, the bleeder-type turbine makes it possible for the railroad to obtain electric power, almost as a by-product. Direct-current power for shop operations is usually produced by motor-generator sets belonging to the railroad company. Now the recently developed mercury-arc rectifier, with its high-efficiency, low no-load losses and freedom from moving parts offers a desirable alternative means.

The tendency to consolidate shop facilities, with its accompanying substitution of modern types of machine tools, is making a material change in the demand for motors and control apparatus. A motor will ordinarily outlast the machine it drives, but is usually rendered obsolete by the scrapping of the machine because the new machine using high speed cutting tools requires motors of greater size and versatility, in addition to the fact that it probably employs a greater number of motors.

Circuit and motor protective devices have been completely revised in recent years; they are governed by motor temperatures, as well as by current, voltage and phase conditions, and the size of such equipment has been greatly reduced. It also much more effectively provides complete protection without damage either to the motor or the protective apparatus, and with little or no suspension of machine operation. New forms of explosion-proof fittings and explosion-proof motors and control permit the use of motors in practically any hazardous location, such as in lacquer spraying rooms, oil houses, grain elevators, etc. Article 32 of the National Electrical Code, concerning electrical wiring in hazardous locations, has done much to extend the use of such materials and devices. The development of the doubly-enclosed motor has also considerably enlarged and improved the field of motor applications.

The most generally accepted application of electric heat is electric welding. Gas and electric welding and cutting have revolutionized shop maintenance methods, and their use is being extended into the maintenance of way and construction fields. Electric ovens are used almost universally in the electrical repair shops, but up to the present time relatively little progress has been made in applying electric heat to heat treating of steel, melting of babbitt and a variety of applications in which accurate temperature control affords a better product and many economies by avoiding spoilage of material.

Curtailed maintenance programs are made most evident in wiring installations, particularly in cases where the wire and conduit are exposed to locomotive gases or salt air, or are buried in cinder fills. Such wiring installations have notoriously short life, no adequate method having been developed to meet the conditions, and maintenance has been deferred because it is not a facility which has to do directly with safety of train operation.

One of the most effective ways of saving money now available to the electrical engineer lies in the scanning of power contracts for the purpose of correcting arrangements that mitigate against the railroad, by consolidating power sources where possible and desirable, by avoiding peak loads with load limiting or load warning devices and by improving bad power factor caused by change in load conditions. Care must be taken not to spend to

correct a temporary need, but much has, and will be done, by attention to these matters.

Passenger Cars

Air conditioning, first installed in passenger train cars in 1930, has been rapidly extended in the face of depression, until there are now more than 600 cars in service and immediate prospects of many more. There are about 40,000 electrically-lighted passenger cars in the country, and it is conceivable that half of these may eventually be equipped with air-conditioning apparatus. Mechanical refrigeration for foods in dining cars is also finding considerable favor.

When the ice system of air conditioning is used, there is only a small increase in demand on the car for electrical energy to operate motors driving pumps and fans. On long runs with relatively few stops, this added load may be taken care of by the existing electrical supply system. This is, however, somewhat problematical, and where the runs are short, the stops frequent, or the car must stand idle for considerable periods, a positive drive for the generator, or a larger generator, or both, must be used to meet the requirements. If this is not done, or in some cases even when it is done, more demands will be made upon the yard charging systems, entailing their enlargement and extension.

The same line of reasoning may be applied to the steam-ejector system of air conditioning, which slightly increases the load on the electrical system of the car.

Where ice is used, electric trucks afford suitable means for delivering the ice to the cars in the yards.

All of the several mechanical systems of air conditioning which have been developed derive their power from the car axles. On one of these systems the power is delivered to the compressor through a magnetic speed reducer. All of the others employ electric generators, ranging from one 7½ kw. and one 4 kw. units to a single 20 kw. unit. A 5 hp. motor is used to drive the compressor. There are also several small motors for pumps and fans and the necessary automatic control.

In the case of the system using the 20 kw. generator it is expected that with a battery of extra size the car will be self-contained and will not require special attention at the terminals. With those having lesser generator capacity, a stand-by motor is needed which can receive a.c. power at the terminals for operating the compressor and keeping the battery in a charged condition. This requires the installation of a system of power outlets in the terminals. Considerably increased battery capacity is required for the mechanical systems. At present there is a strong tendency on the part of the railroads to install the ice system because of its lower first cost, but it seems probable that the movement will be toward the mechanical systems as they are further developed and their cost reduced.

Locomotives

All locomotives are equipped with electric headlights, operated from a steam turbine-driven generator, and a generator of large size (7½ kw.) is employed successfully for the head-end lighting of suburban trains. Such a power source is now also seriously being considered for supplying the needs of air-conditioned cars on the trains. The advent of train control required improved performance and dependability from the turbine-generator, and made it necessary to keep the insulation values on the locomotive wiring system high. Old wire and lax maintenance methods cannot be tolerated on locomotives so equipped.

A new application of electrical equipment to locomotives is head to rear-end communication for long freight trains. Means for accomplishing this satisfactorily, without radio interference, have been demonstrated, and in view of the well-known advantages of such a facility it seems probable that it may find considerable application.

Freight and Material Handling

Freight cars, per se, are not ordinarily equipped with electrical apparatus, but a refrigerator car, equipped with a mechanical refrigerating system which receives its power from one of the car axles, has been developed and demonstrated. The car employs an axle-generator driven by V-belts and a motor-driven compressor.

There is good reason to suppose that the use of container cars will be greatly extended, and electrically-operated cranes are a logical means of handling the containers. The movement to promote store-door delivery will also undoubtedly entail extended use of electrical equipment.

Electric industrial trucks are used extensively in transfer service. It is interesting, in this connection, to note that one operator recently showed how the use of extra batteries for these trucks greatly improved the service obtained from them and reduced the amount of charging facilities required.

Similar trucks are employed by the stores' departments for handling railroad supplies, and there are few engine houses which are not now equipped with crane-type trucks.

Maintenance of Way and Water Service

Compared with its application in other departments, electrical equipment is just beginning to find a place in the maintenance of way department. Recently developed mobile welding equipment is one reason for the extension of electrical machinery into the maintenance field. Similarly, portable gas-engine-driven generators have made possible the use of electrically operated track tools. Changes in water service facilities also make way for the extended use of electrically operated pumps. As stated

Electrical Equipment is Largely Responsible for the Beauty and Comfort of Electrically-Lighted, Air-Conditioned Cars

elsewhere in this issue, pumping plants are now located to suit transportation needs rather than near the source of water; and where electric power is available, automatic electric pumping equipment best suits the requirements of most of the relocated plants. Similarly, electric operation is adapted to water treating facilities.

Oil and Gas-Electric Cars and Locomotives

Electric drive has been demonstrated to be the most practicable drive for cars and locomotives using oil and gas engines of more than 250 hp. In addition, electric power is used for lighting, for ignition, for double-end or multiple-unit control and for the operation of auxiliaries. A considerable number of the locomotives use large batteries to supply peak load requirements. In some instances, as in the case of the stream-lined trains now under construction, separate generating plants are used. It is also the intention of the operators to equip the high-speed trains with air-conditioning.

Lighting

Electric lighting in railroad service is almost universal, extending from the sand house to the finest passenger terminal. In well-lighted classification yards, work is carried on as effectively by night as by day. Cost of lighting has been constantly reduced by improvements in lighting units and increase of lamp life and efficiency. Industrial plants are able to show how good lighting improves output at small cost. Such a thing is difficult to show in railroad service, and it is probably the reason why railroads do not provide lighting facilities as good as those used in industrial plants. The enginehouse is most in need of attention. Lighting and wiring installations in these buildings usually last only a few years, and in few instances are they good enough to provide for doing effective work. It has been demonstrated that enginehouses can be well lighted, and the present condition of undermaintenance with consequent need for new wiring should be followed with applications of lighting that will give the roundhouse worker a chance to do what he is paid for.

Electric Traction

The largest and most distinctively electrical activity in the railroad field is electric traction. It is capable of performance, particularly in suburban passenger and heavy freight service, that can not be equalled by any other form of land or air transportation. Its expansion depends upon traffic density. The largest and most comprehensive electrification in the country, designed to cost $175,000,000, is now in process of construction. Its full advantages cannot be realized until the program is carried out to include a greater mileage of track and all classes of service. Undoubtedly work on this installation will again be speeded up when there is assurance of more stable conditions.

Some of the older electric traction installations are in need of a considerable amount of maintenance, particularly as applied to distribution circuits, and real economies could be made by replacing obsolete and expensive-to-operate switching equipment with modern high-speed breakers and protective relays. Several electrification projects, some entirely new and some extensions of existing lines, have been planned and laid out. These will undoubtedly be initiated when warranted by a return of traffic.

Survey

The most urgent requirements of the electrical department vary considerably with the railroad. Given an opportunity to expand operations, one electrical engineer lists the needs of his railroad, with particular reference to his department, in the following order: 1. Revamping badly depreciated wiring and lighting systems; 2, providing for the needs of air-conditioning in the yards and terminals as well as on the cars; 3, supplying the motor, control and distribution requirements of retooling obsolete shops; 4, continuing the study of more economical power supply, improving existing power plants, changing to purchased power where desirable, examining power contracts, consolidating power sources, avoiding unnecessary peak loads, improving power factor, etc.; 5, providing for more extensive use of oil-electric cars and locomotives.

On two other roads which have extensive electric power distribution systems, which have been in service between 20 and 30 years, there is urgent need for renewing switches and relays used for protecting the lines, and for renewing old insulation. On one of these roads, air-conditioning is looked upon as second in importance, and the requirements of the engineering and maintenance department in the form of welding equipment, track tools and electric operation of pumping plans, as next in importance.

Summing up the requirements of a number of roads, however, indicates that improvement of existing power distribution and lighting facilities will probably receive first consideration when opportunity is given for making needed improvements. Air-conditioning requirements probably take second place, and next in order is the need for reducing the cost of electric power.

As all of the several railroad departments move forward with their rehabilitation work, each will require its quota of electrical materials and equipment for restoration and improvements. The proper and co-ordinated selection of these materials will have much to do with expediting the entire program.

A Place for Trucks and Buses

(*Continued from page 621*)

stitution for local freight service. Under the suggested scheme of motorization of terminal operations, the usability of the motor truck in railroad service would be multiplied many times.

Ways in which motor transport can be utilized by the railways, as outlined in the foregoing, have been demonstrated, as to one form or another, by virtually every railway in the United States. Some railways are using motor coaches or motor trucks advantageously in one type of service, while other railways are employing them with profit in other ways. The time when all the railways will derive every possible benefit from the use of motor transport in all possible kinds of service will come when, the period of experimentation admittedly having been passed, the purchase of the necessary motor vehicles is delayed no longer.

By the rehabilitation of their railway equipment and by the modernization of some of their operating methods, the railways can do part of the job of adapting their service to the new traffic and transportation requirements of shippers and travelers. The whole job, however, can be done only by full utilization of the efficiency and economy available in motor vehicles when pressed into the kinds of service for which they are especially adapted. Other improvements are necessary, of course, but in the co-ordination of trains and motor vehicles lies a very large part of the solution of the problem of meeting competition, recovering lost traffic and handling all business in a manner satisfactory from the standpoint of the patron and most economical from the standpoint of the railway.

Railway Purchases Are Trumps

Millions of deferred maintenance bring carrier's buying problem to front in "new deal"—Expenditures increasing

IN the confusion of conditions affecting railway operation, two facts stand out clearly: (1) that the railways must be reconditioned, and (2) that reconditioning cannot be accomplished without purchases. For almost four years the railroads have been trying to get along without buying anything but the bare necessities. Under the stress of conditions, they have been gambling on service life and counting on scrap piles and idle equipment to supply increasing quantities of the things required for maintenance. Improvement has been at a standstill. This situation has added to the unemployment and to the consequent reduction in railway traffic, and weakened the power of the railroads to maintain their position in a highly competitive business. The railroads must buy vast quantities of supplies to restore the serviceability of their plant, and they must make vast expenditures to effect those changes in facilities and operation which are necessary to the survival of the transportation machine. As these purchases are made, business will respond, railway traffic will increase and produce more revenues from which to pay for the supplies purchased.

Railway Purchases—1933*

	Fuel	Ties	Other Material	Total	Total, Less Fuel
January ..	$15,300,000	$1,850,000	$16,150,000	$33,300,000	$18,000,000
February..	14,000,000	2,000,000	14,100,000	30,100,000	16,100,000
March ...	13,900,000	2,250,000	15,750,000	31,900,000	18,000,000
April	12,000,000	2,160,000	14,840,000	29,000,000	17,000,000
May	12,750,000	2,120,000	16,430,000	31,300,000	18,550,000
June	12,300,000	2,360,000	18,340,000	33,000,000	20,700,000
July	14,500,000	2,700,000	21,800,000	39,000,000	24,500,000
August ..	16,500,000	2,500,000	26,000,000	45,000,000	28,500,000
	$111,250,000	$17,940,000	$143,410,000	$272,600,000	$161,350,000

* Compiled by *Railway Age*. Subject to revision.

Interest in railway purchases grows daily with the increasingly open recognition that retrenchment in purchases has been carried too far, with evidence that purchases are now increasing, and with unmistakable signs that the federal government is now turning to railway purchases in its effort to stimulate employment and revive trade.

Purchases Expanding

Increases in railway purchases are shown by figures prepared by the *Railway Age* from special reports received from the railroads. These figures do not include expenditures for new equipment. Reports for August have thus far been received from 46 railroads earning about 60 per cent of the railway revenues. These reports indicate that August purchases on the Class I roads approximated $45,000,000, an expenditure which compares with $39,000,000 in July, $33,000,000 in June, $31,300,000 in May, $29,000,000 in April, and $33,300,000 in January. Exclusive of fuel, August purchases totaled $28,900,000, as compared with $24,500,000 in July, $20,700,000 in June, $18,550,000 in May, $17,000,000 in April and $18,000,000 in January; while purchases, minus ties as well as fuel, were approximately $26,000,000 in August, as compared with $21,800,000 in July, $18,300,000 in June, $16,430,000 in May, $14,840,000 in April and $16,150,000 in January.

From such reports as are at hand, August purchases were approximately $14,000,000, or about 48 per cent above the corresponding expenditures in April, and about 42 per cent higher than in January, while miscellaneous purchases, including expenditures for car and locomotive repair parts, were approximately $11,200,000, or about 75 per cent higher than they were in April. Although the sum of $272,000,000, which is estimated to have been expended by the railroads during the first eight months of this year, is less than was spent during the same period

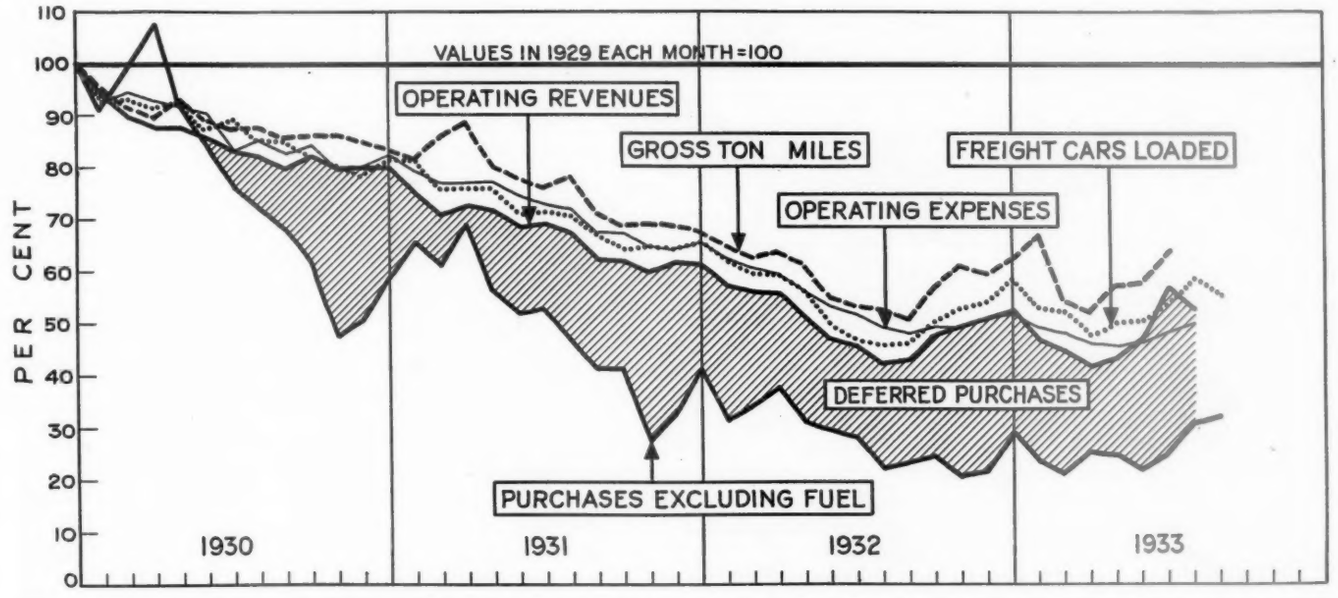


Chart Showing the Comparison Between Railway Purchases, Operating Revenues, Etc., from Month to Month, with Their Values in the Corresponding Months of 1929

of the previous year, the expenditures since April, 1933, dollar for dollar, have been greater than the corresponding expenditures in 1932, and the August purchases were the largest in 18 months. The purchases of a number of roads have been more than doubled since spring.

Government Getting Behind Purchases

The expending program of railway buying has been given impetus by recent negotiations by the federal co-

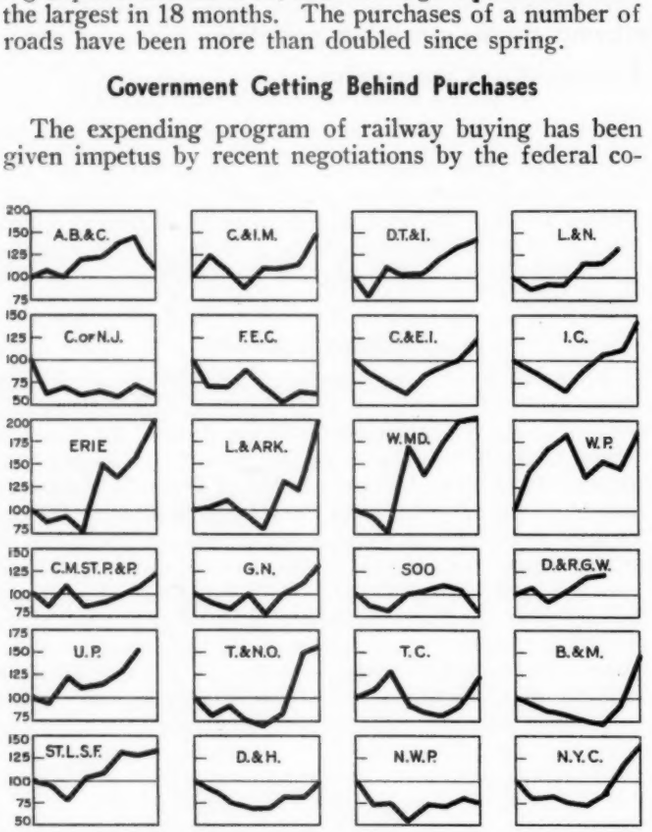


Chart Showing Purchases of Fuel and Other Material on Representative Roads from January, 1933, to August, Inclusive. Purchases in January Taken as 100 Per Cent in Each Case

ordinator with the railroads, culminating in the agreement of 47 railroads to purchase new rail and fastenings in the amount of 1,089,746 tons, subject to a reduction in the price charged by the mills from the prevailing figure of $40 per ton for rails. Possibly by the time this is published, contracts for this rail will have been placed. Such an order will mean an expenditure of at least $30,000,000 for rail alone. It is significant of its effect on the general reconditioning program that expenditures for rail for all the railroads in 1932 were limited to approximately $15,000,000, and they do not appear to have exceeded $5,000,000 during the first eight months of 1933.

Coincident with negotiations for rail and separate and distinct from activities of the Reconstruction Finance Corporation, the President of the United States, under the power granted by the Emergency Act, is reported to be proposing a fund of several hundred million dollars to be employed either to purchase equipment for the railroads or to be loaned to the railroads on unusually favorable terms for this or similar purposes.

Vast Sums for Purchases

There perhaps has never been a period in railway history when it was more difficult to judge future needs by past requirements. The record of railway purchases, however, affords an unusual insight into the reconditioning problem facing the carriers, especially since the railroads are not only built of materials but also require vast quantities of materials for their maintenance, operation and improvement. There are no complete statistics with which to show the contrast between purchases made for the railroads during the last year of federal control and those made in the first year of the period when the railroads launched a united program of rehabilitation and improvement. In 1923, however, railway purchases of materials and supplies amounted in the aggregate to $1,738,000,000, not including equipment and materials and supplies acquired under lump-sum contracts for construction. In 1924, these purchases amounted to $1,343,000,000; in 1925, to $1,392,000,000; in 1926, to $1,559,000,000; in 1927, to $1,395,000,000; in 1928, to $1,271,000,000; and, in 1929, to $1,329,000,000. In contrast, they were reduced to $1,038,000,000 in 1930, to $695,000,000 in 1931 and to $445,000,000 in 1932. Unless purchases during the remainder of this year increase at a much faster rate than at present, 1933 purchases will not exceed the expenditures made last year.

Prior to 1930, the railroads expended sums for locomotive and other fuel, as follows: $617,800,000 in 1923, $481,656,000 in 1924, $462,600,000 in 1925, $473,353,000 in 1926, $438,821,000 in 1927, $384,608,000 in 1928 and $374,048,000 in 1929. Fuel purchases declined to $314,232,000 in 1930, $225,000,000 in 1931 and $178,250,000 in 1932. The outlay for the first eight months of 1933 was $101,000,000.

Cross-tie purchases involved an expenditure of $124,743,000 in 1923, $111,442,000 in 1924, $95,453,000 in 1925, $101,174,000 in 1926, $108,215,000 in 1927, $95,684,000 in 1928 and $83,421,000 in 1929. By contrast, tie purchases amounted to $75,500,000 in 1930, $53,201,000 in 1931 and $27,550,000 in 1932. Rail purchases were $78,965,000 in 1923, and, during the five years ending with 1929, averaged $99,264,000. Corresponding expenditures since that amounted to $75,000,000 in 1930, $50,800,000 in 1931 and approximately $15,500,000 in 1932. Rail purchases during the first eight months of 1933 did not exceed $5,000,000.

Total expenditures for iron and steel products were $464,955,000 in 1923, and in the five years ending with 1929, they averaged $438,909,000 per year. They amounted to but $100,550,000 in 1932, and it is not probable that they will exceed that figure this year. Miscellaneous purchases, which include cement, lubrication, train supplies, electrical materials and a wide variety of other supplies totaled $423,437,000 in 1923 and during the five years ending with 1929 averaged $353,842,000 per year. In 1932 they were only $114,000,000.

Three Billion Less Buying

Dollar for dollar, the railways expended over $200,000,000 per year more for fuel in the five years previous

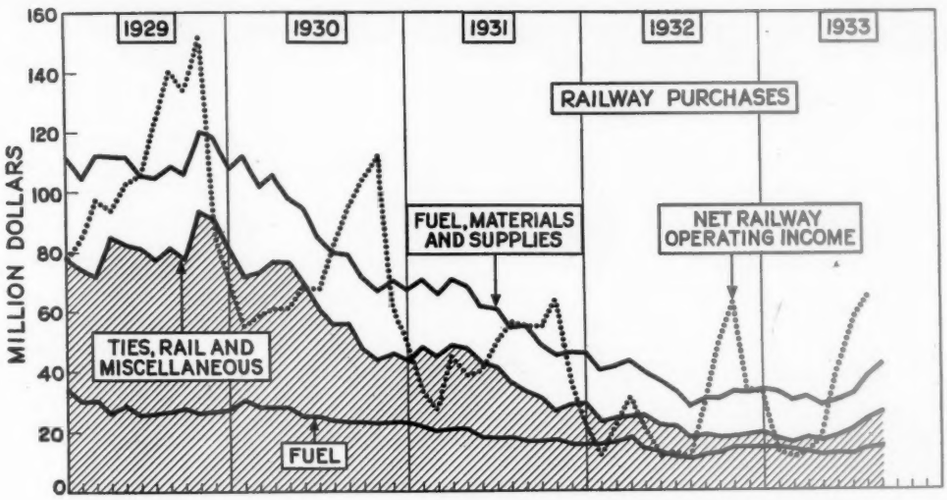


Chart Showing the Expenditures Made by the Class I Railways for Materials and Supplies, Month by Month, Since January, 1929, and the Corresponding Values of Net Operating Income

to 1930 than in 1932, approximately $70,000,000 more for cross ties, approximately $80,000,000 more for rail, over $300,000,000 more for iron and steel products and approximately $950,000,000 more per year for materials and supplies in the aggregate. By the end of 1932, the accumulated reduction in these purchases from the average expenditures per year from 1925 to 1929, inclusive, was almost $2,000,000,000. If the purchases for 1933 do not exceed the sum expended during 1932, this figure will be increased to almost $3,000,000,000.

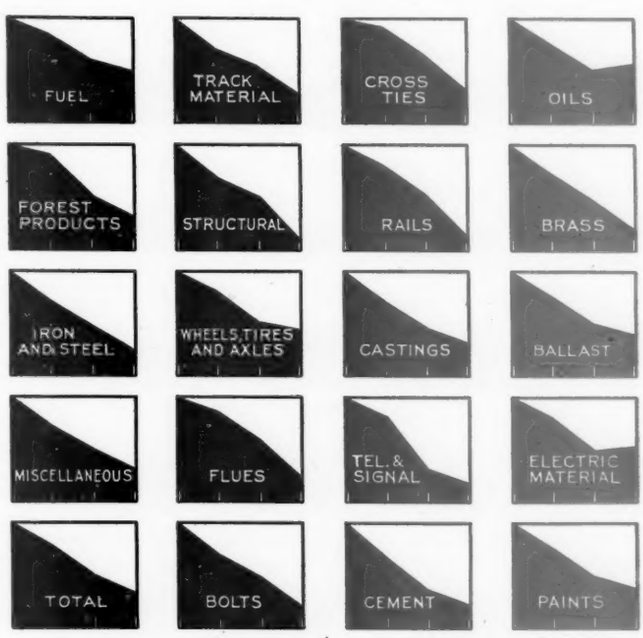
Purchases of Materials and Supplies Class I Railways in the United States—1923 to 1933*, Inclusive

	1923 000 Omitted	1924 000 Omitted	1925 000 Omitted	1926 000 Omitted	1927 000 Omitted	1928 000 Omitted	1929 000 Omitted	1930 000 Omitted	1931 000 Omitted	1932 000 Omitted	1933* 000 Omitted
Fuel	$617,800	$481,656	$462,620	$473,354	$438,821	$384,608	$364,392	$306,500	$224,200	$178,250	$109,550
Ties	232,511	180,872	170,305	186,291	175,729	160,794	157,551	134,600	75,500	52,200	18,040
Iron and steel products	464,955	365,610	419,254	507,302	432,604	397,544	437,840	329,700	220,000	100,550	
Miscellaneous	423,437	324,917	339,863	392,085	348,774	328,395	369,752	267,700	175,300	114,000	140,610
Total	$1,738,703	$1,353,055	$1,392,042	$1,559,032	$1,395,928	$1,271,341	$1,329,535	$1,038,500	$695,000	$445,000	$268,200

Values for 1923 to 1929 inclusive. Bureau of Railway Economics. Values 1930 to 1933 *Railway Age*.
* 8 months 1933.

Added to these purchases are expenditures for equipment and for materials used by contractors of railway improvement work. Such expenditures do not segregate the material from the labor and other expenses, and also include some expenditures which are already accounted for under the statistics enumerated above. However, the railroads expended an average of $308,869,000 a year for locomotives and cars in the five years from 1925 to 1929, inclusive, while expending only $36,371,000 for locomotives and cars in 1932. They expended $478,174,000 per year for improvements to roadway and structures in the five-year period, while expending only $130,823,000 for similar purposes in 1932. The total average annual outlay for additions and betterments was $787,043,000 in the five-year period, as compared with $167,194,000 in 1932. It is estimated that the gross expenditure for additions and betterments per year during the five-year period included approximately $400,000,000 of material and hired labor not considered in general purchases. This is compared with $80,000,000 in 1932. From this it follows that the railroads have expended approximately $3,500,000,000 less for all classes of equipment and supplies since 1929 than they did in the corresponding four years previous, a sum equal to the entire authorization made by the federal government for public work.

Giving due consideration to the effect of changes in material prices, advancement in material conservation and decline in traffic requirements on the reductions, these sums express the requirements of the railroads in normal times and the enormous contribution the railroads make through their purchases to industry. They also indicate one source of the reductions which have been made in railway traffic. This will further appear when it is considered that the railroads ordinarily consume 25 per cent of all the coal and 20 per cent of the fuel oil produced in the United States, 39 per cent of the steel castings, about 20 per cent of all the lumber cut



Charts Showing the Comparison in the Annual Expenditures of Various Classes of Railway Purchases During 1929, 1930, 1931 and 1932. Expenditures in 1929 Representing 100 Per Cent in Each Instance

and 8 per cent of the cement production, and that their consumption of finished iron and steel is also equal to 20 per cent of the total production.

Deferred Purchases Large

The extent to which past purchases measure future needs, immediately or ultimately, depends on many factors and cannot be determined with precision. It is not to be supposed, however, that continued improvement in railway plant is not required. Railroads, if they are to survive, are faced with the necessity of making further improvements—improvements to increase the efficiency and improvements to increase the adaptability of the transportation facilities to new conditions.

Purchases immediately needed are those required to overcome deferred maintenance. Differences of opinion may exist as to the amount of the deferred maintenance, but not as to its presence. The extent of the improvement work done prior to 1930 and the large amount of the new equipment and new facilities provided, together with the higher standards of quality in the purchases of many roads, have been the salvation of the roads during the last four years. Equipment has been put to endurance tests, and, in the maintenance of facilities and track, many roads have departed from the standards of maintenance which prevailed during the last decade. Preventive maintenance has given way to remedial maintenance from the increasing practice of letting the equipment approach more closely the failing point before repairs are made. The robbing of idle equipment to secure repair parts for equipment in service has been widely practiced in the past four years and clearly indicates the extent to which the purchase of new material is required. The extent to which old material is being utilized to meet requirements in place of new purchases is indicated by the fact that such material used on one large trunk road last year was equivalent to almost one-third of the miscellaneous purchases. Except where equipment or facilities are awaiting retirement, these practices have not dispensed with but have merely deferred the purchases required.

Deferred Purchases Pile Up

The service life of a large part of the railway plant is dependent more upon the elements than on wear and tear. Therefore, expenditures required for such work were not largely diminished by the reduction in traffic. Examples of such materials are ties, buildings and other equipment exposed to water and weather. The aggregate expenditures required to keep the track and equipment in repair, on the other hand, naturally declined with the reduced amount of work required since 1929. The extent to which the gross expenditures of the past five years are less than the gross expenditures of the previous five years are not, therefore, a true measure of the deferred buying, even when adjustments are made for price changes.

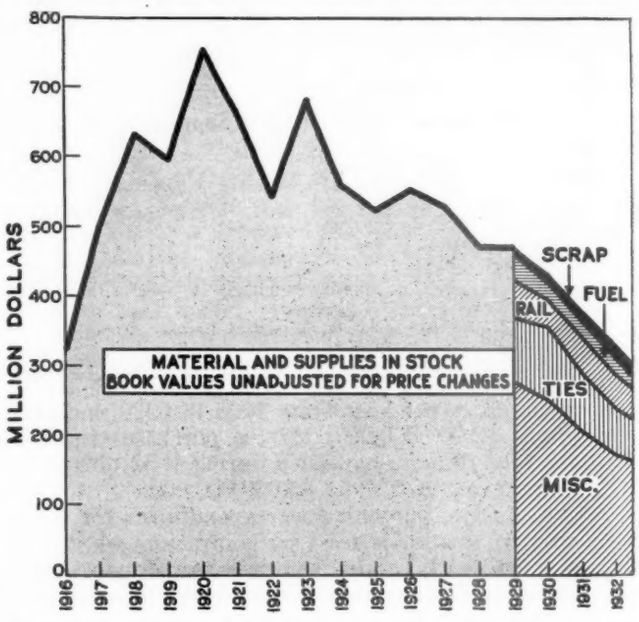
What is believed to be a conservative estimate of the amount of deferred buying may be determined by comparing the purchases made for materials and supplies, exclusive of fuel, with the usual measures of railway business.

Ordinarily, the relation between purchases from month to month and revenues and expenses is sufficiently constant that, within reasonable limits, revenues and expenses can be used as a means of indicating purchases. This uniformity between purchases and revenues and expenses, and also gross ton-miles from month to month, was marked in 1929. By expressing purchases, exclusive of fuel and equipment, made in each month since that time in terms of their percentage of the purchases for the corresponding month of 1929, and doing likewise with operating revenues, operating expenses, gross ton-miles and freight cars loaded per month, it will be seen that the expenditures made for supplies from month to month have declined more sharply than revenues or other measures of railway business. Thus, operating expenses in April, 1932, when purchases were at their lowest ebb, were 41.7 per cent of operating expenses in April, 1929. The number of freight cars loaded was 47.8 per cent; gross ton-miles, 52.9 per cent; and operating expenses, 46.4 per cent of their corresponding values in April, 1929, while purchases were only 25.1 per cent as large. If there had been no deferred maintenance, routine purchases instead of falling to 25 per cent in April, 1932, would have declined only approximately as much as operating revenues. It follows that deferred purchases of the railroads for materials and supplies, exclusive of equipment and the materials for special construction projects, now reach a total of over $600,000,000. It is only necessary to consider the vast amount of material which has depreciated independently of traffic conditions to realize the conservativeness of this

Railway Inventories

	Fuel	Ties	Rail	Other Material	Scrap	Total
Jan. 1, 1930	$34,000,000	$91,500,000	$54,000,000	$279,000,000	$11,500,000	$470,000,000
Jan. 1, 1931	28,700,000	103,000,000	45,500,000	251,000,000	10,200,000	438,400,000
Jan. 1, 1932	23,400,000	85,000,000	48,700,000	204,100,000	12,400,000	373,600,000
Jan. 1, 1933	20,200,000	67,400,000	48,200,000	171,000,000	12,400,000	319,200,000
July 1, 1933	17,300,000	62,500,000	44,000,000	161,000,000	9,710,000	294,510,000

Compiled by *Railway Age*.



A Comparison of the Book Value of Annual Inventories of Class I Roads from 1916 to 1933, Inclusive, Unadjusted for Price Changes, Depreciation or Inactive Material

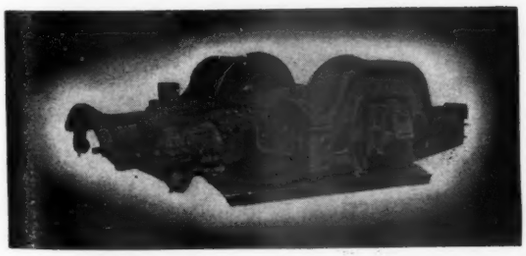
Continued on next left-hand page

MORE POWER! *in a hurry*

The need for more power to haul increasing traffic is acute. In some places, there is already a shortage.

Yet hundreds of engines have a potential source of power equivalent to many new locomotives. They were wisely built to provide for Boosters—now is the time to use this source of extra power.

Booster power is economical, efficient power which permits increased loading of the more modern locomotives and thus avoids the use of many inefficient locomotives now in storage awaiting call—locomotives that should never be run again.



The Locomotive Booster is the cheapest and quickest way of increasing transportation capacity.

Start a BOOSTER *Program* NOW!

FRANKLIN RAILWAY SUPPLY COMPANY, INC.

NEW YORK CHICAGO MONTREAL

estimate of the amount of stored-up buying which is pressing to be released.

Inventories Depleted

Increasing the pressure for purchases is the depleted state of the available supplies of materials on hand. The contrast between the railway inventories at present and those available when the railroads launched their rehabilitation work following the war is striking. The general program to meet the requirements which have already developed for material is interesting to contemplate. It is now generally appreciated that the unemployment throughout the country is chiefly unemployment incident to the reduced consumption of capital goods. It is also appreciated that the railroads are one of the principal consumers of such materials. Few public works utilize, either in their construction or maintenance, as large and as varied a volume of supplies

Gross Expenditures for Additions and Betterments to Railway Property

Railways of Class I, Excluding Switching and Terminal Companies

Year	Equipment Expenditures (thousands)					Roadway and Structure Expenditures (thousands)						
	Locomotives	Freight train cars	Passenger train cars	Other equipment	Total—equipment	Additional track	Heavier rail	Additional ballast	Shops and engine houses	All other improvements	Total—roadway & structures	Grand total (thousands)
1923	$208,966	$409,665	$40,105	$22,988	$681,724	$108,745	$27,866	$9,471	$51,214	$180,129	$377,425	$1,059,149
1924	102,456	318,571	53,134	19,448	493,609	116,725	32,037	10,825	39,834	181,714	381,135	874,744
1925	59,778	222,476	41,207	14,653	338,114	145,757	32,952	11,665	31,345	188,358	410,077	748,191
1926	108,263	185,792	58,117	19,750	371,922	166,758	42,184	16,519	46,882	240,821	513,164	885,086
1927	76,975	136,490	53,770	21,466	288,701	139,175	43,742	16,230	35,236	248,468	482,851	771,552
1928	51,501	116,549	41,215	15,036	224,301	116,494	47,193	15,748	24,323	248,606	452,364	676,665
1929	70,660	191,917	38,670	20,059	321,306	129,148	46,862	17,049	36,561	302,795	532,415	853,721
1930	88,494	181,028	44,791	13,956	328,269	114,486	47,101	11,455	29,179	342,118	544,339	872,608
1931	25,821	29,548	13,850	3,886	73,105	64,535	29,341	5,319	9,041	180,571	288,807	361,912
1932	17,142	12,066	4,750	2,413	36,371	22,304	12,047	2,809	3,127	90,536	130,823	167,194
Total 1923-32	$810,056	$1,804,102	$389,609	$153,655	$3,157,422	$1,124,127	$361,325	$117,090	$306,742	$2,204,116	$4,113,400	$7,270,822

NOTE: Foregoing figures represent *gross* amounts expended for additions and betterments to railway property. No expenditures chargeable to operating expenses are included, nor is allowance made for the retirement of any class of property. Value of salvage used in rebuilt equipment or elsewhere is not included, as no money outlay is involved.

Bureau of Railway Economics.

railroads were returned to private operation in March, 1920. On December 31, 1920, the investment in unapplied materials and supplies amounted to $755,500,000. Yet, on December 31, 1932, the corresponding investment was only $377,335,000, and, by July, 1933, it was reduced to $291,900,000. The difference between the inventory then and now is accounted for partly by a difference in the cost of the materials involved, but only in part. To a greater extent, the difference measures the reduction in the volume of stores.

Year after year, the railroads have devoted specialized attention to diminishing the stock required for the protection of current needs, preferring to rely upon an efficiently organized system of procurement for their requirements in order to avoid the handling and carrying charges and other costs involved in carrying large quantities of materials. The reductions which were made by the end of 1930 when the depression began were notable, but the extent to which the stocks have been drawn down since that time especially invites attention. At the end of 1929, the inventory of ties on hand amounted to approximately $91,000,000, and at the end of 1933, to $67,000,000, while it is approximately $62,000,000 now. The inventory of rail, consisting largely of spare rail on line and second-hand rail for relay purposes, declined from $54,000,000 at the close of 1929 to approximately $44,000,000, while the inventory of miscellaneous materials is now approximately $163,000,000, as compared with $270,000,000 at the close of 1929.

It is also to be observed that the inventories now include large quantities of materials which are obsolete and have not been written off, also materials which are held for special work or for the protection of special equipment and which are not available for general use, while, statistically, the present book value of inventories in relation to the consumption of materials suggests an ample supply, current inventories have been so depleted of the supplies in common use that they can no longer be depended upon to protect current requirements for more than a few weeks and are constantly putting the railroads to the necessity of making emergency purchases.

Buying Will Increase Traffic

What would happen if the railroads were to launch a program of buying such as do the railroads. By releasing the orders for supplies and equipment needed to overcome deferred maintenance alone, the railroads would immediately stir basic industry all over the country with new life. The raw materials required to fill the railway orders would of themselves increase railway traffic and the renewed activity throughout the country, stimulated directly or indirectly by such a program of work at this time, would increase railway revenues before the time came to pa for much of the material purchased by the roads. It would also reverse the present direction of railway transportation and prepare the roads to meet more effectively the demands for their service and the inroads of other forms of competition. At the same time, the government, by assisting the roads as it is now proposing to do, will be making further progress in the direction of business recovery. It begins to appear that railway purchases will be the trump cards in the "new deal."

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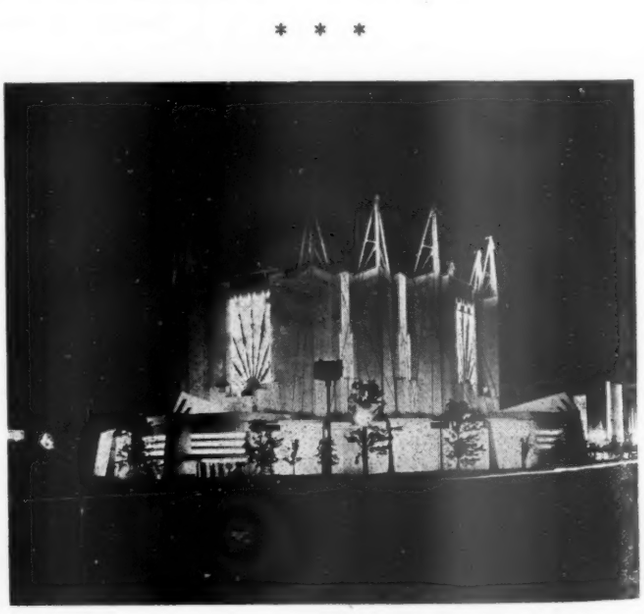

A Night View of the Travel and Transport Building at the Century of Progress Exposition

How Finance Equipment Purchases, Larger Maintenance Program?

Indications are that loans can be secured from the government on very favorable terms

IN any plan for eradicating deferred maintenance or in making capital expenditures for the purpose of promoting operating economies in advance of a considerable recovery in railway earnings, the first consideration, of course, must be: Where is the money going to come from? At the present time, there is but one answer to that question for all but a fortunate few of the railways, and that answer is—from the government. The railways show a proper spirit of caution in resorting to this source. Many of them have been forced to do so during the past couple of years, not for the purpose of making expenditures, but to avoid defaulting on their funded debt and thus bringing down the whole financial structure which is based on railroad bonds. Having accepted these loans, the railroads have found the government anything but an inattentive creditor.

The criticism has been voiced that bankers have in times past exercised their power as creditors to affect policies of management. However true or false such reports may have been, there can be no question of the alertness of the government as creditor concerning the management policies of railways which have become indebted to it during the present crisis. The outstanding, but not the only, instance of this creditor control is the extensive revision downward of official salaries enforced by the Reconstruction Finance Corporation upon the railways indebted to it.

Borrowing to Restore Maintenance

On the other hand, there can also be no questioning the fact that large economies can be made and net revenue materially increased by the wise replacement of much obsolete railroad equipment—and by that is not meant merely cars and locomotives—with modern products. As to deferred maintenance, there is great reluctance on the part of many to borrow money for eradicating it. This reluctance is probably justified in sound business policy to the extent that postponement has not caused damage which will cost a great deal more to overcome later on than it will at the present time. After all, the primary responsibility of railway management is to the owners and the owners' interest is not conserved if the plant is permitted to deteriorate to the extent of a loss greater in amount than a loan which would prevent the deterioration.

Neither is the owners' interest conserved by too great a veneration for the balance sheet. The Interstate Commerce Commission and the Co-ordinator's office have been very open-minded in permitting the retirement of obsolete equipment, charging the undepreciated book value to surplus account rather than to operating expenses. This is not strictly accurate bookkeeping, since it understates the operating expense account. On the other hand, it is not accurate accounting to include items in the corporate surplus account which, in their effect on earnings, are actually a liability. It is earnings and not the balance sheet which controls the income of the investor and, in the long run, the value of his securities.

Private Financing Outlook Unpromising

Once railway management has decided that the acceptance of loans for the purpose of restoring maintenance, at least to a level to prevent deterioration, and to make those capital expenditures which promise a large and quick profit, is in the interest of railway owners, it remains next to be seen under just what terms such loans can be secured. While no official pronouncements on this subject have been made, inquiry reveals that the authorities are convinced of the necessity for stimulating the "capital goods" industries to an extent that, in all likelihood, funds for projects of proven worth can be obtained under better terms now, from the government, than have obtained in the private money market for many years. This opportunity may be matched with the equally obvious fact that private capital is continuing to be extremely timorous, what with the uncertainty about the future of the dollar and that, as a consequence, there appears to be no likelihood of an early return to conditions under which railway loans can be placed through customary channels at terms sufficiently favorable to justify extensive financing, even for the purchase of the most profitable of devices and equipment.

If there should occur before many months a measured revival in the private capital market, it is even more unlikely that the terms it would afford would be anywhere near as favorable as those now available in Washington. This view is amply sustained by the fact that during the "easy money" boom era, the private money market offered no such terms to the railways as those which they could get—if our observations are correct—in Washington today. We have, for example, reason to believe that funds for the purchase of equipment might be available at an interest rate of not more than 4 per cent, with maturities as great as 25 years and with notes the only security required.

1930 Situation and Present Not Analogous

In 1930 the railways were appealed to by the Administration to enlarge their maintenance and capital outlays for patriotic purposes, and they were badly let down as a consequence. Naturally they are quite properly wary of any plan of the present government which might lead them into similar difficulties. Conditions now, however, are vastly different from those of early 1930. At that time there was no deferred maintenance to consider, and capital expenditures had been maintained at a high rate for six consecutive years. Much of the government-stimulated expenditure in that year, therefore, must have gone for maintenance not needed in view of declining traffic and for some increase in capacity where a surplus already existed. Now, however, a great deal of deferred maintenance has accumulated and

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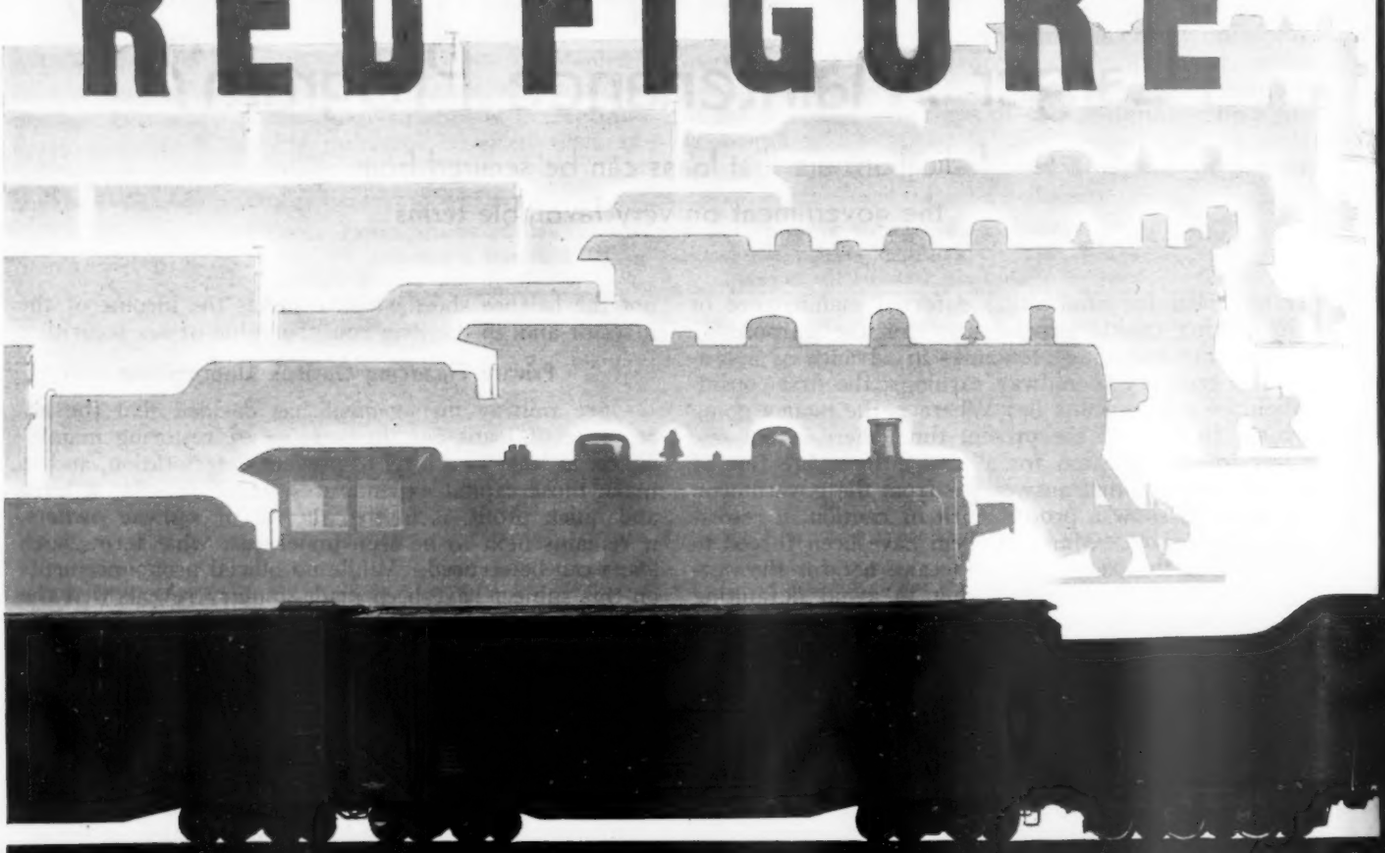
"RED FIGURE"



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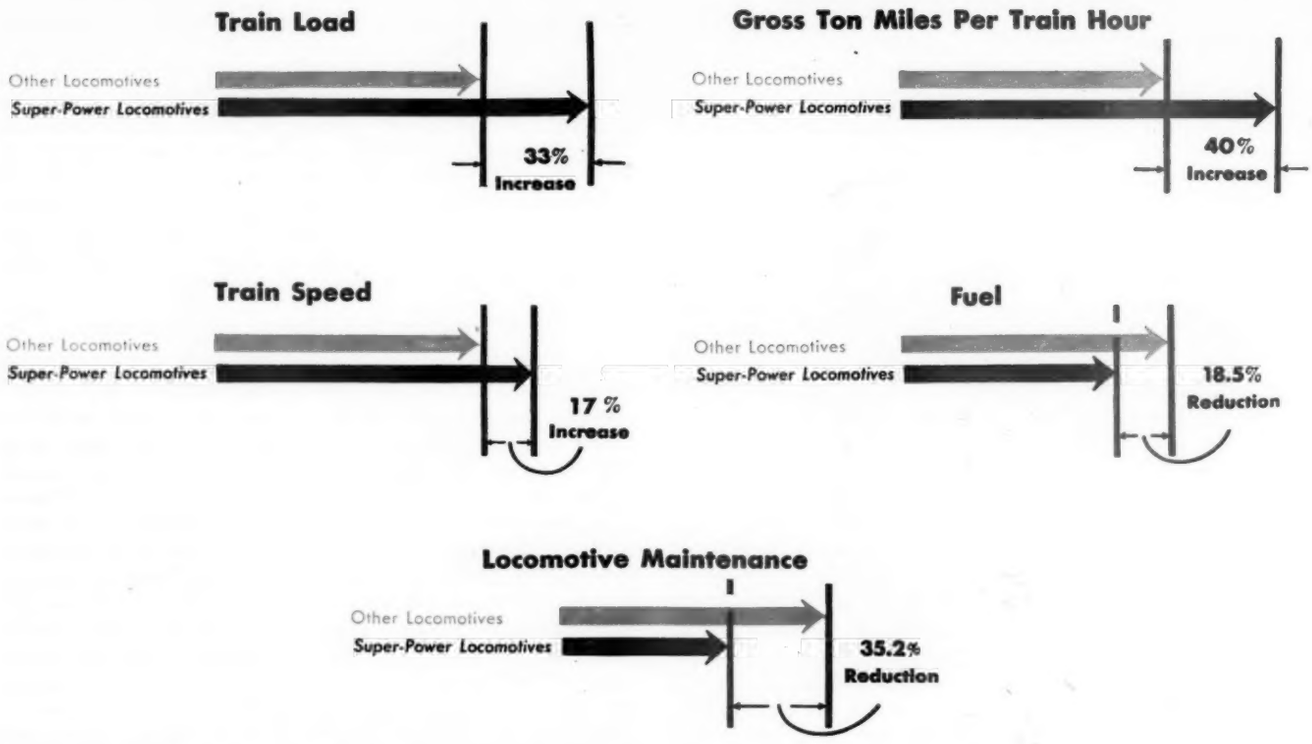
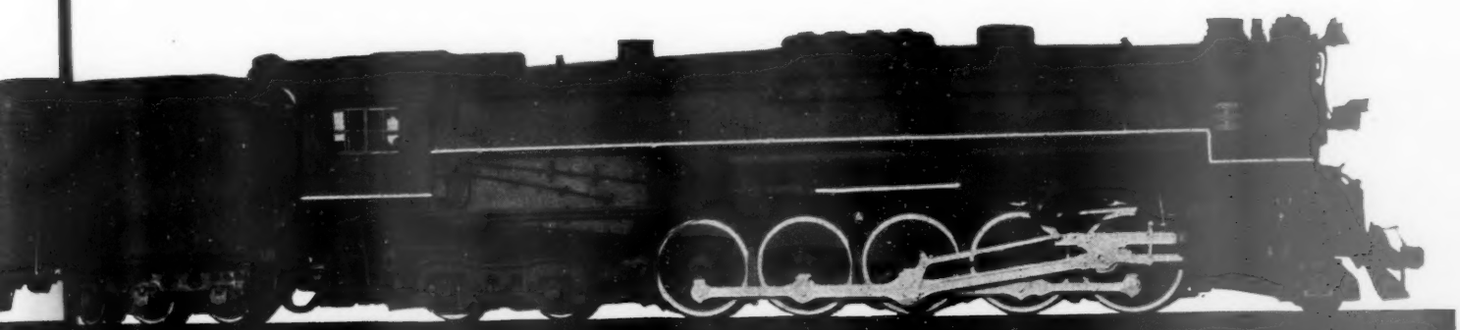


LOCOMOTIVES



Super-Power Money Earners

Obsolete locomotives slow down operation by getting in the way of fast-moving, modern power; cost more for maintenance and are out of keeping with the idea of modern, economical transportation. ● Replace them with Super-Power Money Earners. Super-Power Locomotives, in regular operation, on one railroad reduced the unit cost of operation 25 per cent.

LIMA LOCOMOTIVE WORKS INCORPORATED LIMA OHIO

there has been a famine in additions and betterments for almost three years. It would appear, therefore, that the railways, by moderate outlays of funds obtainable on favorable terms at the present time would be pulling their own chestnuts as well as the government's out of the fire, whereas the 1930 activity was almost a pure act of charity.

The determination of the government to stimulate the capital goods industries is unquestionably one of the outstanding characteristics of its current policy. Practically every branch of the government which has any relation to activity of this kind is exerting itself to the limit in the attempt to secure action. After three years of starvation, the railways are not in a position to play Santa Claus, but that does not preclude their acceptance of a good bargain if it is offered.

Loans to Railways vs. Donations to Competitors

There is no place where a revival in capital goods industries can be begun so promptly and with such widespread effects on the general economic fabric as it can by a revival of railway purchasing. This fact has not only been recognized privately by governmental authorities, but it appears in the Recovery Act itself, where provision is made for "public works" loans to the railroads. That there has been so little demand for such loans has undoubtedly led to the diversion of funds for public works, including development of facilities for free use by the railways' competitors, which otherwise might have gone for cars, locomotives and other equipment to improve railway earnings. There is no justification, of course, for borrowing money just to keep a competitor from getting it. On the other hand, if sound reasons already exist for borrowing the money, then the fact that doing so will prevent a competitor from getting it as a free gift, should offer, at least, some slight additional incentive.

Whether the railroads act upon the opportunities offered them or not, however, as far as equipment loans are concerned, there is already under negotiation a proposed order for rail and other track materials totaling some one million tons, to be financed in part from public works funds. In addition, it is understood, if the railways do not buy some motive power and rolling stock soon, it is likely that the government may place orders for some 500 locomotives and 25,000 freight cars which they hope to be able to show to the railways that they will save money by leasing.

Passenger Equipment Maintenance Drastically Cut

(*Continued from page 603*)

trains and similar equipment, the railways are afforded a notable opportunity to utilize outstanding recent developments in power generating equipment, modern light-weight, but strong materials, and a technique of car construction so revolutionary and vastly improved as compared to former methods that present equipment is rendered largely obsolete.

The use of special improved steels, strong aluminum alloys, welded construction in place of riveted joints and improved modern steel castings, has made possible reductions up to 50 per cent in car weight per passenger, accompanied, in many instances, by an even higher factor of safety than usual. The substantially decreased car weight facilitates rapid acceleration and deceleration and, in conjunction with streamlined construction, permits higher operating speeds with relatively low power consumption and fuel cost. Special brake equipment is necessary and, in fact, has already been developed to meet the requirements of extra high-speed operation. Roller bearings are an essential element in securing desired operating results with the new equipment. While high-speed cars and trains of the type mentioned are still highly experimental in character, it cannot be questioned that they represent an important step in the right direction. High speed transportation is what the public wants and the railways will no doubt exhaust every reasonable effort in an attempt to meet this demand.

High speeds, however, are not an unmixed blessing, since they tend to increase operating costs and it, therefore, becomes a real question to decide how much speeds can be increased without entailing increased operating costs and higher passenger rates which will actually cause a net loss of traffic. The problem of rates to be charged for passenger service is many sided and, to a large extent, outside the scope of this article. Rates and costs, however, are the most important single factor in traffic handled and, in the long run, rates must be charged in proportion to costs. While the light-weight cars and trains will normally require less power per passenger for operation, this advantage may be lost and the power requirements actually increased if speeds are carried to excess. The railways can go a long way towards solving this particular problem by embodying the principles of streamlining, along with modern materials and methods of car construction, in the new equipment. To a considerable extent, this should permit the development of relatively high speeds and yet keep the unit operating costs low.

From the point of view of comfort, modern conveniences and attractively appointed equipment, the railways have a great potential advantage over all competitors, but much of this advantage has been sacrificed during the past two or three years by deferred maintenance and the lack of new car installations. While much can be accomplished by the provision of rubber-cushioned equipment, comfortable modern seats, smoking compartments, wash-room facilities, attractive interior decoration, modern lighting, etc., principal interest, from a comfort standpoint, centers about air conditioning, which provides clean properly-tempered air, the year around and has already proved its effectiveness in attracting passenger traffic. Here again, the element of cost enters into the problem, but is not a fundamental objection since it is estimated that operating expense and fixed charges will be more than offset by one additional passenger per car per day.

The favorable progress which air conditioning has made in public esteem, as well as that of railway men, is reflected in the large number of individual cars and complete trains which have been provided with this equipment. Installations have also been extended to Pullman cars, and the annual report of Pullman Incorporated for 1932, for example, shows that during the year 106 cars were equipped with air-conditioning apparatus. Judging by the present trend, it seems probable that within a few years practically all first-class passenger trains in this country will be completely air-conditioned.

With due consideration to providing the comforts and conveniences mentioned, high speeds and, insofar as practicable, low-cost transportation, the railways have a real opportunity in the coming months to improve their standards of equipment and service and place themselves in a much stronger position to meet the competition of other passenger-transportation media.

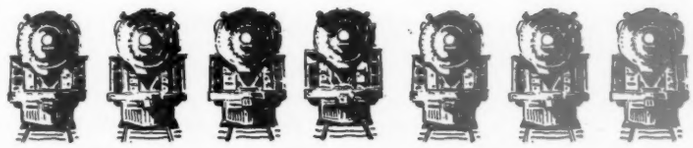
Continued on next left-hand page

There's More to Security Arches Than Just Brick

HARBISON-WALKER REFRACTORIES CO.

Refractory Specialists

ARCH BRICK SERVICE *follows thru*



A lot of new engines is delivered and there on the job is the American Arch Company service man to help them over the first few runs.

This practice of American Arch Company saves the railroad trouble and often avoids engine failures.

For example, locomotives built to the same design by two different builders showed a considerable variation in spacing between the Arch supports. An American Arch Company service man easily remedied the difficulty by prescribing the correct Arch Brick for each lot of engines and forestalled possible failures on the road.

The interest of American Arch Company extends beyond the sale of Arch Brick to the service a railroad secures from its Arches. Hence the highly developed service department of experienced combustion experts. Their services yearly save thousands of dollars for American Arch Company customers.

NRA MEMBER U.S. WE DO OUR PART

AMERICAN ARCH CO.
INCORPORATED

Locomotive Combustion Specialists » » »

Eastman's Views on Motor Transport Regulation

IN an address before the Interstate Bus and Truck Conference at Harrisburg, Pa., on October 20, Joseph B. Eastman, Federal Co-ordinator of transportation, took occasion to outline the general state of mind with which he is aproaching questions which have to do with motor vehicles.

At the outset explaining, for the benefit of those who have not a very clear idea as to just what the Federal Co-ordinator of transportation may be, he said: "A predominant idea behind the creation of this office was that our national railroad system suffers from much waste motion and unapplied or misapplied effort, due to its ownership by many separate companies and the consequent fact that it is operated by a small army of independent feudal chieftains who fight a good deal among themselves and band together for the common good with considerable difficulty. It was thought that a representative of the national government might, as a wholly neutral agent, help to co-ordinate the efforts of these chieftains and eliminate some of the waste motion.

"The second thought, and a very important one, was that the railroad system is only a part of the transportation system of the country, and that the latter is in need of attention in its entirety. The President and Congress were rather busily engaged on other matters, and they were not sure as to just what should be done with this transportation situation. So they told the Co-ordinator to make a diagnosis and submit prescriptions which could be considered when Congress convened again. A more descriptive title for the position might, therefore, be Federal Co-ordinator of Railroads and Doctor of Transportation. One of the best attributes of a doctor is a good bedside manner which will induce confidence in his patients and promote good cheer. With some difficulty, under all the circumstances, I am endeavoring to cultivate such a manner, but whether it will survive after Congress is called into consultation remains to be seen."

Beyond any doubt, he said there are large possibilities in the use of the motor vehicle as an auxiliary of rail service. He was by no means suggesting that it should be confined to such use, but only that this opens up a very important field for development. This is particularly true of terminal operations, where the truck has a capacity for flexible and rapid service which the railroad cannot hope to possess. "It is not too much to say that the time may come when many railroad terminals will be removed from congested centers to outlying districts, thus releasing land which in many instances would have a high value for other purposes, and when trucks will take over a considerable part of the work of collecting and delivering freight now done by switch engines. Both trucks and busses will also provide a less expensive substitute for much branch-line rail service."

Discussing his proposed legislative recommendations, Mr. Eastman said it ought to be clear that no regulation or restrictions should be imposed upon any form of transportation merely for the purpose of benefiting some other form of transportation. He continued in part as follows:

Public regulation of motor vehicles is not all of one kind. I shall mention four different types, each directed toward a different purpose. One type has for its purpose the protection of the safety, convenience, and purse of the public in the use of the highways. I take it that the need for such regulation is conceded. The questions are what form it shall take, how a proper degree of uniformity can be attained throughout the country, and whether there is any need for action by the federal government. It is the latter question which I am undertaking to investigate.

You will note that I mentioned protection, not only of the public safety and convenience, but also of the public purse. I did this because there are two possible ways of protecting safety and convenience. One is to restrict the character, dimensions, weight and speed of the vehicles which use the highways, and the other is to make the highways wider and stronger, reduce their curves and grades, and protect them by means of various safety devices, or build more highways. In choosing between these methods, cost is the vital factor. The country cannot go on indefinitely improving these highways without counting the cost.

Experience in both state and federal service has convinced me of the need of utilizing local authority to the maximum and avoiding centralization in Washington wherever that is possible without sacrifice of the public interest. At the same time I realize that the extraordinary improvement in means of communication has made this a much smaller country than it once was and has vastly increased the extent and importance of interstate commerce.

I am approaching this question of highway regulations without any preconceptions, and with no desire to invoke the federal power unless clear need appears. In that event, it may be that the authority can be entrusted to some governmental agency which can hold it in reserve, to be used sparingly and only when and where occasion requires.

Wages and Working Conditions

A second but closely related type of public regulation is over wages and working conditions. There has been much such regulation, both State and Federal, in the case of the railroads, more especially over working conditions, and based very largely on promotion of the public safety. With respect to wages, the regulation is confined to the procedure for collective bargaining and mediation. There has been no similar federal regulation of motor vehicles, except so far as it is provided by the national industrial recovery act. Perhaps the codes will supply all that is necessary at this time. The danger which exists is, of course, that in the competition of the motor vehicle with railroads and other forms of transportation, labor will, unless protected, be exploited at the expense of its own wellbeing and even of public safety. I am endeavoring to get the facts, as fully as may be, in order to determine whether there is here need for some degree of federal intervention beyond that which the codes will supply.

The third type of public regulation has to do with taxation, license fees, and the like. I refer to it as regulation, because it is based on considerations which are somewhat different from those which govern ordinary taxation. This arises from the fact that the right-of-way which motor vehicles use, unlike that used by the railroads, is provided and maintained out of public funds. It is one thing to provide such public ways for the use of the people of the country in their capacity as individuals, and it is another thing to provide them for business enterprises which will use them to compete as carriers with other necessary transportation agencies which must depend upon their own capital and revenue resources. To what extent, under such circumstances, should special taxation be imposed, in addition to general taxation, to sustain the burden of these public ways, and to what extent is such special taxation already imposed? The question grows in importance with the enormous growth of the public investment in these highways and their maintenance costs.

You must not assume from the statement of this question that I have jumped at conclusions as to its answer. What we are after is the facts, to whatever conclusions they may lead. There is nothing simple about this problem, notwithstanding the guise of simplicity in which it is often arrayed by partisans of one side or the other. I am not even sure that all the facts are yet capable of ascertainment.

Before passing from this subject, let me also say that this part of our investigation is not confined to motor vehicles. It embraces water and air carriers as well, and also the railroads. Public funds and both public and private donations played quite a part in the building of the railroads in the early days, and even in later times.

Protecting the Public

The fourth and final type of public regulation which I shall discuss is the type which is embodied in the interstate commerce act, so far as the railroads are concerned. Its primary purpose is to protect the using public, directly or indirectly. Regulation of rates is the keystone, but many other matters may be covered, such as accounting, service, the issue of securities, the construction of new facilities, the abandonment of old facilities, and the

union of companies through consolidation or otherwise. A common error is that the chief purpose of such regulation is to protect the public against extortion. In the case of the railroads, that was the purpose of the so-called granger legislation of western States in the 70s, but the interstate commerce act, which had its origin in 1887, was aimed more at the evils of competition than at the evils of monopoly. The fierce competition of the railroads with each other and with the water lines had brought about a situation where rebates and discrimination ran rife, no industry knew what its competitor was paying, certain places and localities were favored above others, and the railroads were gutting their own earning power.

A somewhat similar situation exists today. Due to the rapidly increasing competition from unregulated forms of transportation, confusion and instability are permeating the rate structure of the country. For some time the railroads were slow to make rates to meet truck competition, but they are speedily overcoming this initial reluctance. and the motor vehicles and the water lines as well are becoming apprehensive. They have filed and are filing vigorous protests with the commission against reductions in rates by the railroads, asking that they be suspended for investigation. It is an anomaly of the situation that the law gives this opportunity to the water lines and motor vehicles, whereas the railroads have no corresponding opportunity to seek public protection against rate reductions on the part of their competitors.

We are studying this situation to see what should be done about it by the federal government. As normally happens, the states have been active in advance of the federal government, and we are investigating the results of these experiments with the utmost of care. Practical tests add more to knowledge than do theories. There are many difficulties, due to the fact that many of the motor carriers for hire are not common carriers, and that there are many motor trucks which are not operated for hire at all, but as a mere department of a private industry. An additional difficulty, and a very great one, is the multitude of small, individual operators. Regulation under such circumstances is far less simple and practicable than where there are large companies to deal with, as in the case of the railroads.

Some Observations

I cannot anticipate the conclusions which we may reach, but I shall venture certain observations. I entertain little doubt that whatever transportation regulation the federal government undertakes should be administered by a single body and not by several, or at least that any division of responsibility should not follow carrier groups. Otherwise each regulatory authority will become the partisan of its own form of transportation, and there will be much less chance of proper coordination. Some fear that this may result in basing water rates and motor rates on rail rates, without adequate consideration of the special conditions surrounding rail and motor transportation. I believe that no regulation can be successful which does not take these special conditions into account. The ability of private industries to provide their own transportation, as many are now doing, by operating their own vessels and trucks is a sufficient reason, if there were no other.

The ideal to be achieved is, of course, a transportation system which will utilize each agency in the field for which it is best fitted and discourage its use where it is uneconomical or inefficient. I know of no way to arrive at any approximation to this result without adequate consideration on broad lines of relative costs of operation. It is quite possible, in this connection, that this will involve a considerable reconstruction of the present railroad rate structure, to the extent that existing rates are based on commodity values and other elements besides cost.

The objective of the emergency act is the formulation of a national transportation policy designed to furnish service and exact charges which will promote the commerce and industry of the country. I have used the analogy of a doctor diagnosing a case and prescribing the remedy, but in reality such an analogy is imperfect and inadequate. The formulation of such a national transportation plan must comprehend all agencies of transportation, for it would be incomplete and soon obsolete unless the inherent utilities of each of these agencies were appraised and their relative potentialities of service determined. The duty of the Co-ordinator is to plan, if he can, a transportation system which will give the railway, the highway, the waterway, and the airway the place in the sun which economically belongs to it. He must play no favorites but be guided solely by the public interest, as nearly as he can locate it.

I regret my inability at this time to give you my final conclusions, but I undertook this work with the conviction that it requires the most careful preliminary study, and that nothing is to be gained but much may be lost by snap judgments in the absence of an adequate diagnosis of the facts. By the time that Congress convenes I expect to be able to present many conclusions, but I assure you that if the facts are not then ready for a conclusion on a particular matter, I shall not hesitate to defer recommendations until a matured judgment can be reached. I am confident that many important developments will emerge, in the service which is performed, in the rates which are charged, and in the character of government regulation, and that they will be developments for the good of the country.

Freight Car Loading

WASHINGTON, D. C.

REVENUE freight car loading in the week ended October 14 amounted to 664,058 cars, an increase of 9,630 cars as compared with the previous week and of 14,368 cars as compared with the corresponding week of last year. This was, however, slightly below the figures for the week of September 2, which represents the peak so far this year and it was 97,538 cars below the 1931 figures. The principal increase as compared with last year was that shown as to ore loading, while miscellaneous freight, forest products, and coke also showed increases. As compared with the week before the only increases were those in coal and livestock. The summary, as compiled by the Car Service Division of the American Railway Association, follows:

Revenue Freight Car Loading
Week Ended Saturday, October 14, 1933

Districts	1933	1932	1931
Eastern	139,766	138,256	163,164
Allegheny	124,650	114,462	147,666
Pocahontas	46,827	47,628	50,641
Southern	91,308	96,694	108,084
Northwestern	97,710	81,363	101,265
Central Western	108,683	112,333	126,582
Southwestern	55,114	58,954	64,194
Total Western Districts	261,507	252,650	292,041
Total All Roads	664,058	649,690	761,596
Commodities			
Grain and Grain Products	28,755	33,076	36,720
Live Stock	24,544	24,889	29,602
Coal	129,139	143,712	151,584
Coke	6,859	5,191	5,925
Forest Products	24,747	19,552	24,644
Ore	31,603	7,129	21,480
Merchandise L.C.L.	171,727	176,958	215,014
Miscellaneous	246,684	239,183	276,627
October 14	664,058	649,690	761,596
October 7	654,428	625,089	763,818
September 30	661,827	621,658	777,712
September 23	652,669	595,604	738,036
September 16	652,016	587,246	742,614
Cumulative total, 41 weeks	22,742,208	22,247,471	30,247,121

The freight car surplus for the last half of September averaged 380,088 cars, a decrease of 6,188 cars as compared with the first half of the month. The total included 223,001 box cars, 106,038 coal cars, 20,633 stock cars, and 9,768 refrigerator cars.

Car Loading in Canada

Car loadings in Canada for the week ended October 14 were affected by the holiday on October 9 and decreased from 53,198 cars for the previous week to 50,303 cars, but the index number rose from 69.17 to 72.44. The total was 3,529 cars greater than for the corresponding week in 1932. Grain, livestock, coke and merchandise were lighter than in 1932 but all other commodities showed substantial increases.

	Total Cars Loaded	Total Cars Rec'd from Connections
Total for Canada:		
October 14, 1933	50,303	18,402
October 7, 1933	53,198	19,745
September 30, 1933	51,229	19,958
October 15, 1932	46,774	18,143
Cumulative Totals for Canada:		
October 14, 1933	1,555,108	753,971
October 15, 1932	1,726,428	779,995
October 10, 1931	2,003,197	1,045,315

Communications Department appears on second left-hand page

Let's Meet the

With traffic on the increase, with costs mounting and an obvious need for new and modernized equipment, the railroads are confronted with serious problems to provide better and quicker service at the lowest possible cost—yet, a service that is sound and profitable to the railroads. In fact, the present situation is a definite challenge to the railroads. Let's meet it together! In the past Elesco has

• • •

Here Are Ways in which *Elesco* MORE CAPACITY

The Elesco Superheater. Modern locomotives handle more tonnage at higher speeds and with marked fuel economy in comparison with earlier designs. Modern locomotives, of necessity, use improved boiler design and improved superheater design, represented by the Elesco type "E" superheater. The Elesco type "E" superheater increases locomotive capacity and decreases the fuel rate. Briefly the important factors of design and operation are as follows: (1) An increase of 25 per cent in the sustained horsepower capacity, as shown in Fig. 2. This is accomplished by: (a) *Increased* TRUE boiler efficiency of 5 to 7 per cent. (b) *Increased* evaporating surface of 6 to 8 per cent. (c) *Increased* superheating surface of better than 50 per cent, with increase in superheat of 75 to 100 deg. F., which reduces steam consumption 7 to 10 per cent. (2) An increase in steam area through the superheater of as high as 30 per cent, which reduces the pressure drop between boiler and cylinders.

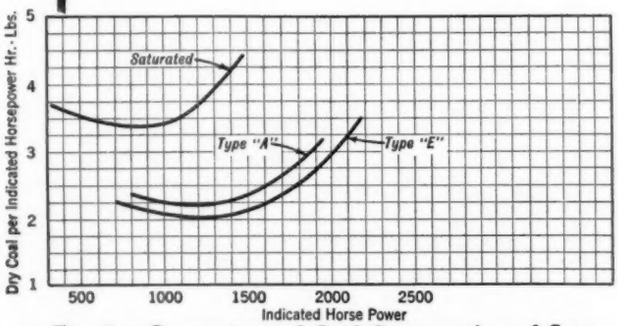


Fig. 1.—Comparison of Coal Consumption of Saturated Steam Locomotives and Locomotives Equipped with Type "A" and Type "E" Superheaters.

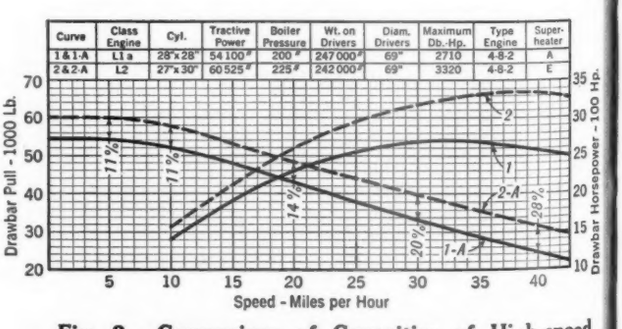


Fig. 2.—Comparison of Capacities of High-speed Passenger Locomotives Equipped with Type "A" and Type "E" Superheaters.

Superheaters—Feed Water Heaters—
Exhaust Steam Injectors—
Superheated Steam Pyrometers—
American Throttles

ELESCO

THE

Challenge Together!

worked hand-in-hand with the railroads in solving motive power problems. Today, Elesco is better prepared than ever, and equally willing to do its part. New developments, new improvements, further standardization have been effected in Elesco equipment and services to the end that we might be prepared to work with the railroads to meet just such a situation.

• • •

will give your locomotives —MORE ECONOMY

The Elesco Feed Water Heater. More heat escapes out the stack than is used in useful work in the cylinders. To reclaim any part of this *waste* heat is to economize—which is just what the *Elesco* feed water heater does in using the heat in a portion of the *waste* exhaust steam to preheat the boiler feed water. Economies effected include: *increased* sustained boiler capacity, *increased* cylinder horsepower, *increased* overall boiler efficiency, and substantial savings in fuel and water. Nearly 4,000 locomotives are equipped with Elesco feed water heaters for more economical operation.

The Elesco Exhaust Steam Injector. For those who prefer the contact type of feed water heater, the exhaust steam injector is a solution. It has the advantage of accomplishing results through kinetic energy or the injector principle, rather than by use of pump and heater combination. It is capable of effecting economies in fuel and water from 8 to 12 per cent, besides increasing locomotive capacity, and with low maintenance costs proves to be a very profitable investment, as well as an efficient boiler feed water preheater.

A Special Superheater Unit Service
New Units for Old

Supplementing the manufacture of superheaters, we maintain a special service for rebuilding superheater units that have become unserviceable or are in need of repairs.

New units for old—that's what this service provides for those old and unserviceable superheater units returned to our "Unit Hospital." The units are carefully examined by experienced workmen who sort out the serviceable lengths of tubing. This tubing is then straightened, sandblasted and prepared for re-fabrication. From this stock of reconditioned serviceable tubing we make up new units as they are ordered. Classified as "remanufactured" units, actually they are new units made from reconditioned tubing—a first-class job—at less than half the price of new units built entirely from new tubing.

The Elesco unit remanufacturing service makes it possible to get double-duty but always at full capacity—from your superheater equipment.

SUPERHEATER COMPANY

60 East 42nd Street, NEW YORK — A-817 — Peoples Gas Building, CHICAGO

Canada: THE SUPERHEATER COMPANY, LTD., Montreal

Communications . . .

Railways Maintain More Miles of Highway Than of Railway

NEW YORK.

TO THE EDITOR:

Being an ardent railroad enthusiast and an avid reader of the *Railway Age*, I have been following with considerable interest your campaign against unfair competition.

In this connection, I feel that your editorial of September 23 regarding the amount of school taxes paid annually by the railroads of the country, and the one in the October 7 issue showing the highway taxes are of particular importance in placing the matter before the public consciousness in a concrete way. The fact that the highway taxes paid by the railroads in one year was sufficient to cover the entire maintenance cost on over 300,000 miles of highway, takes on special significance when it is brought to mind that the total amount of first track in the United States (including even Alaska) is less than 250,000 miles, while the total mileage, including main tracks, yard tracks and sidings, is still less than 430,000 miles.

WALLACE M. SNOW

A Simple Method for Passenger Fare Reductions

ST. AUGUSTINE, FLA.

TO THE EDITOR:

The question of the reduction in railway passenger fares seems to be approaching a climax. Sentiment in favor of some reduction in fares has become so general that definite action in this matter can not long be further delayed.

Although the majority of transportation officers are agreed that a reduction in passenger rates should be made, there is no unanimity of opinion as to what this reduction should be. Many proposed basic rates have been discussed and have their enthusiastic proponents. Difference of opinion on this question is so great that there is danger of rates being adjusted on a sectional basis. This would be extremely unfortunate and would only serve to complicate an already complex fare and tariff situation, which even now is beyond the comprehension of the public and many ticket agents. Such action would also be contrary to the spirit of the Emergency Railroad Transportation Act, one of the purposes of which is to foster closer co-operation and co-ordination in the transportation industry.

I am therefore prompted to suggest a method of passenger rate adjustment, which seems to have received very little or no consideration on the part of those who have been studying this question, and which appeals to me as an extremely logical, simple and practical procedure. It is in brief as follows:

1. For travel in Pullman cars apply the present basic rate of 3.6 cents per mile, with the elimination of the present surcharge.
2. For coach travel, 50 per cent of the present basic rate of of 3.6 cents per mile, or 1.8 cents per mile.
3. One and one-half times these one-way fares for round trip tickets, whenever called for—with limit to suit, say 30 days.
4. For conventions of real importance and for parties of say 25 or more traveling together reductions on a percentage basis may be agreed upon as occasion may justify.

The advantages of this method of reduction and fare adjustment are quite obvious:

1. It is an extremely simple and workable method.
2. It entirely eliminates the necessity of issuing new tariffs at a cost of many thousands of dollars at a time when utmost economy is paramount.
3. Such a reduced fare basis could be placed in effect immediately by telegraphic instructions without the delay involved in even getting out a table.
4. The new rates would be clear and understandable to both public and ticket sellers and are easily and accurately arrived at from existing tariffs.
5. The collection of additional fare from passengers who make part of their trip in coaches and part of their trip in Pullman cars would be greatly simplified.
6. As a rule long distance travelers do not object to paying for the luxury, safety and conveniences that are available in Pullman cars. They apparently are willing to pay even the higher charges of the airplanes for speed only.

I am hoping you will think well enough of this plan to give it space in the next issue of the *Railway Age*.

J. D. RAHNER,
General Passenger Agent, Florida East Coast.

Time to Revive "See America First" Campaign

CHERRY VALLEY, MASS.

TO THE EDITOR:

As a constant reader of *Railway Age* the article appearing on page 237 of the August 12 issue entitled "Progress in Merchandising Railway Passenger Service" has particularly impressed me, for it brings very forcibly to mind many thoughts which I have had along these same lines.

Having personally traveled by rail to The Century of Progress, observation would indicate that to whatever may be accredited the success of the stimulation of passenger traffic it has been a huge success. And why not? When you board a train you are free from the hazards of highway transportation, thus affording complete relaxation and an opportunity to enjoy the scenic beauty enroute. So much for 1933, but what of the future?

As pointed out in the aforementioned article the success of the campaign depends entirely on the co-operation of all the roads for "United we stand, divided we fall." Many of the railroads here in the East (with which I am more familiar) have for some time operated special week-end and over-holiday trips to Niagara Falls, Washington, D. C., Montreal and other points, the most important being this year's "On to Chicago" drive. These excursions have been thoroughly enjoyed by the patrons to many of whom they would have been an impossibility but for the co-operation of the various roads and the Pullman Company in offering attractive rates with no curtailment of service. These factors have aroused a great deal of enthusiasm and today the public is by far more railroad-minded than one or two years ago. To keep up that interest is of vital importance, so now is the time to spread to fields afar and aspire to greater heights of success.

Tourist agencies have sponsored conducted tours to all parts of the country, but to the participants these have proved expensive, due in no small degree to the unnecessary overhead incurred by having a tour guide. In comparison there have been very successful trips to our Nation's Capital made possible at low cost through the combined efforts of railroad and steamship lines, the tour conductors being regular employees of the transportation companies who were well versed in the desires of the traveler.

The average person appreciates the latest in railroad equipment so in planning tours special thought should be given to this point.

Knowing what the public desires why not a huge drive for next year on "Seeing America First?" Let us set the dates between May 1 and November 1 as the time for joint effort to manifest itself in the common cause and East meet West and vice versa?

The Golden West with its veritable fairyland of wonders—dude ranches, sunny California, Yellowstone Park, etc., holds a lure for the Easterner while the East abounds in vacation lands and innumerable points of historic interest of which the Westerner has only a book knowledge.

Countless numbers would avail themselves of an opportunity to visit these points on railroad-conducted all-expense tours were attractive rates offered. Such trips would keep the travel-by-rail idea constantly before the public and after all a satisfied customer is the best form of advertising.

(Miss) ELIZABETH G. DALY.

NEWS

No Basic Fare Reduction in East for the Present

Statement reveals policy of watchful waiting for data on results of Western experiment

Executives of Eastern railroads have decided to make, at this time, no change in basic passenger rates, according to a statement issued on October 23 by the Passenger Committee of the Eastern Presidents' Conference. The statement points out that rates in effect in Eastern territory have been declining for some time and that the average per passenger-mile is now less than three cents. It also referred to the difficulty of securing sufficient new traffic to offset the adverse effect on revenue of lower rates, and calls attention to increased costs of passenger train operation which are in prospect because of NRA codes and necessary expenditures for improvement in passenger equipment.

The statement in full reads as follows:

"Announcement was made by the committee of Eastern rail presidents, which was appointed by the Eastern Presidents' Conference to give consideration to changes in basic passenger fares, that it had been determined to make no change in the basic rates at this time, but to make such special rates as will tend to attract and increase rail travel.

"It was pointed out that under the passenger rates now in effect in Eastern territory the average rate per passenger per mile for the year 1932 was less than 3 cents, and on some of the heavy passenger carrying lines as low as 2.66 cents per passenger per mile. This figure has shown a steady reduction year by year for some years past.

"It was further pointed out that the rate which would tend to produce a sufficient increase in the volume of traffic to offset the reduction in charges was extremely difficult to determine, and after the rates adopted in the Western territory have been in effect for a few months it will be possible to determine much more accurately than at present what the net results may be.

"Attention was called to the fact that the expense of passenger train operation is being materially increased by the increased cost of fuel and other supplies under the various NRA Codes, and that the railroads are further facing large capital expenditures for air conditioning and other improvements to passenger carrying equipment, so that it is extremely important that changes should not be made in the basic fares which will result in less net income from the transportation of passengers.

"Study of the entire situation in relation to special rates is being actively pursued by a committee of chief passenger traffic officers, who will report to the presidents' committee when this study has been completed."

Short-Sighted Motor Manufacturers

Let us take the Ozark region back of St. Louis. There is nothing livelier on the face of the earth than this old and crumbling mountain range, mellowed by the patina of time. Yet to see it, one proceeds much of the time in peril of being bumped off the road by a truck load of hogs or a shipment of chickens. The automobile manufacturer invites us to buy his product and see the country, and then sends out upon the highway those leviathans which carry his cars from one point to another in pyramided masses and make it unsafe for us to use the very artifact he would sell us.

More accidents upon the highways are due to invisibility occasioned by commercial traffic than to any other single cause. The driver of an automobile, tediously laboring behind a goods train, is too much concerned for his own safety to enjoy whatever pleasing prospect may present itself by the way. The motorist trying to get around a truck carrying four catapulted automobiles, a common spectacle upon the highways of Missouri, might well wonder why the manufacturer should prejudice the sport from which he derives his bread and butter. In 15 years, we have killed more people upon our highways than lost their lives in all our country's wars.

From an editorial in the St. Louis Post-Dispatch.

Merger in Prospect for Southwestern Bus Lines

A merger of the Southwestern Transportation Company, highway subsidiary of the St. Louis Southwestern, with the Western Greyhound Lines, the Pickwick Greyhound Lines of Arizona, the Pickwick Greyhound Lines of Texas and the Southland Greyhound Lines, in which the Southern Pacific is interested, is expected to take place shortly, according to reports from St. Louis. The Southwestern Transportation Company, it is said, will continue the operation of its freight truck lines in Arkansas, Missouri and Texas but will discontinue the operation of motor coaches. The headquarters of the new company, in which the individual lines are to be merged, will be in Ft. Worth, Tex., and its routes will extend through Arkansas, Illinois, Colorado, Kansas, Missouri, Oklahoma, Louisiana, New Mexico, Arizona, Tennessee and Texas.

Data Sought on Rail Use of Other Transport Media

New Eastman inquiry concerned largely with interest of railways in other carriers

Co-ordinator Eastman has sent a 77-page questionnaire to all steam and electric railroads and switching and terminal companies subject to the interstate commerce act in order to develop a variety of information required for the purposes of studies being conducted by his Section of Research.

The inquiry which includes 47 main questions, is largely concerned with the interests which the rail carriers have in motor, water, air and other transportation facilities and calls for comprehensive detailed information as to the uses which they make of such facilities in relation to their respective rail operations, the rates and costs, etc. Other major divisions of the inquiry relate to the kinds and amounts of taxes paid by the railroads and their motor subsidiaries, and to the wages, hours and working conditions of employees of the railroads and their subsidiaries who are engaged in motor operations and in such of the railroads' water operations as have not been covered by a previous inquiry. Certain inquiries of a general character are also included in question No. 47, as follows:

(a) What provisions of the interstate commerce act or of other federal statutes prevent or restrict respondent or its rail subsidiaries in utilizing, directly or indirectly, motor, water or other facilities to the fullest practicable extent in co-ordination with its or their rail facilities for the purpose of rendering better service or of reducing costs, or in entering into other forms of transportation?

(b) To what extent do the laws and/or regulations of the states and their subdivisions have the effects indicated in (a) above?

(c) To what extent does the absence of federal or state legislation have the effects indicated?

(d) What specific accomplishments or undertakings would result from the removal of any obstacles now present and, how would these benefit the public?

(e) To what extent do provisions in the charter of the respondent or its rail subsidiaries have the effect indicated in (a) above?

Toronto Railway Club

The Toronto Railway Club will hold its next meeting on Friday evening, November 3 at the Royal York Hotel, Toronto. W. O. Cudworth (C. P. R.) will present a paper on track maintenance.

Continued on second left-hand page

MODERN

OUR Railroads are one of our biggest key industries. As buyers they form one of the foremost stimulating and sustaining forces in our economic mechanism. And their vast purchasing power, time and time again, has been the force that has started us out of depressions of the past — creating just that confidence in the people at large that is so needed today.

■ We hear many dire predictions today, such as that our Railroads are done — that they are on their way out, etc. But people close to the picture, who know, will tell you that for a long, long time to come, at least 75 per cent of the freight traffic of this country, as measured in ton-miles, is going to be carried by our Railroads — that in the near future they are going to be given a more fair and equal opportunity to compete for traffic — that the days of adverse Railroad legislation are gone, and legislation affecting our Railroads in the future will be helpful. The future of our Railroads is much brighter than is generally believed.

■ If our Railroads, therefore, would step into the market and do some forward buying, and among the items bought, would include, say 1,000 locomotives, distributing the locomotives week by week among the main Railroads of the country, it would be one right gesture delivered at the right time that would start business again on the up-grade.

■ Of all the items bought by anyone or any industry, especially in quantity, few if any offer anything like the same opportunity for such a wide distribution of work. It would be a direct attack on the unemployment situation. The news itself, announced through the daily press, showing that the Railroads were again buying and that they had confidence once more in the future, would have a tremendous influence on that mass of people with incomes under 5000 dollars a year who represent 83 per cent of the buying power of the country.

POWER

■ Their purchase can be easily financed.

■ They can be purchased now at a very attractive price — in all probability at the most attractive price that they will be sold for years to come.

■ They are truly a self-liquidating investment; we know that economies in operation due to the use of the modern power at this moment available represent, in some cases, savings of 20 to 40 per cent annually on the investment.

■ They are an investment that sooner or later will have to be made if our Railroads are to secure anything like the net return to which they are entitled. The total costs effected by the use of the locomotive are more than one-third of all Railroad operating expenses. And these motive power expenses have been unusually high during the past seven or eight years for several reasons. First, the cost of maintenance per unit of work done, increases steadily with advanced age. Secondly, the thermal efficiency of the modern locomotive has been greatly improved over that of the power unit built prior to ten years ago. And finally, the character of traffic, particularly freight traffic, has changed radically in the past ten to fifteen years. There is a large and growing demand for high speed freight service, which can be met economically and effectively only with motive power having adequate boiler and engine capacity and large driving wheels, all designed to pull heavy loads at high speeds.

■ Practically none of the locomotives built more than ten years ago are competent to perform this service.

■ Like many other big industries before them, our Railroads, more and more every day, are rapidly approaching a time and a situation when and where they too must decide that big important question — which must be thrown away, the equipment which is expensive to operate, or the market?

30 CHURCH STREET · NEW YORK · N·Y·

W. N. Doak Dies; Labor Secretary Under Hoover

Had recently resumed former duties with the Brotherhood of Railroad Trainmen

William N. Doak, vice-president of the Brotherhood of Railroad Trainmen and former Secretary of Labor in the cabinet of President Hoover, died of a heart ailment on October 23 at his home in McLean, Va. He was in his 51st year. Mr. Doak, since the close of the Hoover administration, had resumed, in addition to the B. R. T. vice-presidency, his other previous positions with the B. R. T.—that of editor and manager of "The Railroad Trainman" and that of national legislative agent. In the latter capacity Mr. Doak recently represented the B. R. T. at NRA hearings on the proposed code for the motor bus industry.

Mr. Doak was born at Rural Retreat, Va., on December 12, 1882, and received his education in the public schools of Wythe

William N. Doak

county, Va., and the Southern Business College at Bristol, Va. He entered railway service in 1900 with the Norfolk & Western as a clerk and was promoted to yard conductor in 1904. He served as local chairman of the Brotherhood of Railroad Trainmen from 1904 to 1908 at Bluefield, Va., was general chairman of the brotherhood on the N. &. W. from 1908 to 1916 and in the latter year he was elected vice-president. During the regime of the United States Railroad Administration during the war he was a member of Railway Board of Adjustment No. 1, and he later took an active part in various wage proceedings before the Railway Labor Board and other tribunals. He also acted as arbitrator in various cases.

During the Hoover campaign of 1928 Mr. Doak was director of the labor bureau of the Republican National Committee. His appointment as Secretary of Labor, which came on November 28, 1930, when he was selected as successor to James J. Davis, who had resigned to become senator from Pennsylvania, was opposed by representatives of the American Federation of Labor on the ground that the post should go to one affiliated with the A. F. of L. The B. R. T., like the other train service brotherhoods, is not an A. F. of L. affiliate.

In selecting Mr. Doak, despite this A. F. of L. opposition, Mr. Hoover said of his appointee:

"Mr. Doak has been identified with organized labor all his adult life. For 16 years he has been a general officer of the Trainmen, taking part in great numbers of labor negotiations. I have received endorsements of Mr. Doak from several score of labor unions, some of whom are members of the American Federation of Labor. I know that Mr. Doak will represent all labor in his public duties, and that he will reinforce the sympathetic attitude of the Administration to the great problems of the wage earner.

"While President Green of the A. F. of L. has publicly stated that he will oppose Mr. Doak's appointment because Mr. Doak's union is not affiliated with the American Federation of Labor, he informs me that he holds Mr. Doak in the highest personal esteem.

"I do not feel that I can consent to the principle of debarment of the railway employees, or other labor unions and associations, or any labor man in the United States, from the opportunity or the aspiration to attain any office in this land. I have the highest respect for Mr. Green and the American Federation of Labor, but Mr. Green's enunciation that appoinments must come from the organization in fact imposes upon me the duty to maintain the principle of open and equal opportunity and freedom in appointments to public office."

Oregon Truck and Bus Law Upheld

The Oregon truck and bus law has been declared constitutional, in all respects, by the Supreme Court of that state. This decision reversed that of the Marion County Circuit Court which had declared invalid certain of the regulatory provisions of the act which affect contract carriers. The Supreme Court concludes that the business of the contract carrier on the public highways may be supervised and regulated as contemplated by the act because it is "affected with a public interest," and sustains the regulation of the rates of contract carriers to the extent of fixing both minimum and maximum rates.

Labor Executives Prepare Legislative Program

The Association of Railway Labor Executives at a meeting in Washington last week discussed the legislative program which they expect to present to Congress when it meets in January, including proposals for a reduction in working hours and a pension plan. They will also submit their proposals to the federal co-ordinator of transportation to be considered in connection with his forthcoming recommendations for legislation. A committee, headed by D. B. Robertson, president of the Brotherhood of Locomotive Firemen and Enginemen, was appointed to carry on an "educational campaign" against the so-called Prince plan for railroad consolidation.

Three Other Roads Join P.R.R. Store-Door Plan

B. & M., Maine Central and Grand Trunk are prepared to participate in proposed arrangements

The Boston & Maine, the Maine Central and the Grand Trunk are prepared to join the Pennsylvania in the establishment of store-door collection and delivery service for l. c. l. freight, it was revealed following a meeting of Eastern traffic executives in New York on October 19. In addition, the New York, New Haven & Hartford and the Delaware & Hudson are expected to participate as overhead bridge carriers between the P. R. R. and the B. & M. as is the Detroit & Toledo Shore Line as an overhead bridge carrier between the P. R. R. and the Grand Trunk Western.

The P. R. R. store-door delivery service, as announced in the *Railway Age* of October 21, is expected to be installed on December 1. Eastern roads, other than those mentioned above, are considering individually the matter of joining in the plan with a view to subsequent meeting of interested lines.

The statement issued after the October 19 meeting by D. T. Lawrence, chairman of the Traffic Executive Association—Eastern Territory, reads as follows:

"At meeting of traffic executives of Eastern railroads held at 143 Liberty street, New York, today further consideration was given to the intention of the Pennsylvania to establish store-door collection and delivery service at points served by its lines and lines which might indicate their willingness to join in these arrangements.

"The meeting had been called to ascertain what other Eastern railroads desired to participate in these arrangements and to determine the practicability of a uniform effective date for the requisite tariffs.

"After an extended discussion it was announced by the Pennsylvania that its tariff would be made effective December 1, 1933, as to shipments originating at and destined to points on its road. It was stated by the Boston & Maine, the Maine Central and the Grand Trunk Railway System that they are prepared to join the Pennsylvania in its proposed arrangements effective on the date named.

"The matter of action to be taken by other Eastern lines in view of these announcements will receive consideration by the individual managements with a view to subsequent meeting of interested lines at an early date."

Roads Propose to Meet Water Competition for Wet Goods

The Interstate Commerce Commission has suspended from October 25, until May 25, 1934, the operation of tariff schedules which proposed to reduce the all-rail rates on alcoholic liquors, in carloads, from eastern points to transcontinental points on the Pacific Coast, in competition with coastwise traffic via the Panama Canal. For example, it was proposed to reduce the rate on whiskey from Louisville, Ky., from $2.75 to $2.50 per 100 pounds.

Rearrangement of I. C. C. Organization Is Effected

Commission acts to take advantage of authority conferred by the amendment to Section 17

The Interstate Commerce Commission has recently effected a considerable rearrangement of its organization by divisions and of the assignments of work, business, and functions to take advantage of the authority conferred upon it by amendment of Section 17 of the interstate commerce act earlier in the year which authorizes it to delegate functions to individual commissioners, or boards composed of employees, subject to certain limitations. The purpose is to expedite the despatch of work, while some rearrangement of divisions was made necessary because Commissioner Eastman, while acting as co-ordinator, has been relieved of most of his duties as commissioner except when called upon in the event of a tie vote. Commissioner McManamy has taken his place as chairman of the legislative committee and Division 4, which mainly handles financial matters, now consists of Commissioners Meyer, Brainerd, and Mahaffie. Mr. Eastman is, however, still chairman of Division 6, which also includes Commissioners McManamy and Lee, and which handles such matters as formal complaints seeking construction of new roads or procurement of additional facilities, matters relating to efficiency and economy of operation, and orders arising out of the railway labor act, and the safety appliance, boiler inspection, hours of service and similar acts.

The assignments to individual commissioners include the following:

Special permissions or other permissible waiver of rules regarding schedules of rates under Section 6 (3); applications under Section 20 (11), as to released rates; and matters arising under Ex Parte No. 13, with respect to tariff files—commissioner to whom Bureau of Traffic reports (Commissioner Aitchison).

Distribution of carrier accounts and the spreading of items over periods of time, under Section 20a—commissioner to whom Bureau of Accounts reports (Commissioner Eastman).

Uncontested matters relating to the transportation of explosives and other dangerous articles—commissioner to whom Bureau of Service reports (Commissioner McManamy).

Applications for authority to hold the position of director or officer of more than one corporation, when the corporations are all part of the same system, under Section 20a (12)—commissioner to whom Bureau of Finance reports (Commissioner Meyer).

Applications and complaints on the special docket—commissioner to whom Bureau of Informal Cases reports (Commissioner Tate).

Applications for admission to practice before the commission—individual members of the Committee on Admissions to Practice severally.

The reference of cases involving supposed violations of law to Department of Justice for investigation and possible prosecution—commissioner to whom Bureau of Inquiry reports (Commissioner Porter).

Consideration and disposition of merely procedural matters in any formal case or matter including extensions of time for compliance with orders, except investigations on commission's own motion and except in a contested proceeding involving the taking of testimony at a formal hearing—chairman of division to which subject matter or particular proceeding may have been assigned.

Such matters heretofore have usually required the attention of a division of commissioners.

The Bureau of Formal Cases is to report to the end of the year through the chairman, ex officio, and after January 1 through Commissioner Mahaffie. The Bureau of Law is to report through Commissioners Farrell and Aitchison. The Bureau of Locomotive Inspection, the Bureau of Safety, and the Bureau of Service are to report through Commissioner McManamy. The Bureau of Statistics will report through Commissioner Brainerd, and the Bureau of Valuation through Commissioner Lee.

New York Railroad Club Annual Dinner

At the regular monthly meeting held October 20, Chairman Vreeland announced that the annual dinner would be held in New York City on Thursday, December 14, the place to be announced later.

Austro-Daimler Car on Cotton Belt

The Austro-Daimler pneumatic tired rail car, which was described in the August 5 issue of the *Railway Age*, will be placed in service on the Cotton Belt on October 30. The car will operate daily between Dallas, Tex., and Jonesboro, Ark., a distance of 491 miles.

Pick-Up and Delivery at Nebraska Stations

Installation of pick-up and delivery service for l. c. l. freight is soon to be offered at most of the railway stations in Nebraska by the railroads operating in that state, in an effort to recover freight traffic which has been lost to trucks. The supplementary service is expected to be put into effect about December 1.

North Dakota Wheat Embargo

No difficulties have been encountered by the railroads as a result of the embargo placed on wheat moving out of North Dakota by Governor William Langer on October 15. The governor ordered the embargo as a means of raising the price of North Dakota wheat and instructed the National Guard to stand ready to prevent any movement of wheat from the state. Railroad attorneys of the Great Northern, the Northern Pacific, the Minneapolis, St. Paul & Sault Ste. Marie, and the Chicago, Milwaukee, St. Paul & Pacific, at a conference at St. Paul on October 18, concluded that the railroads, as common carriers engaged in interstate commerce, were compelled by law to accept goods offered for shipment, and that when once accepted such shipments immediately come within the jurisdiction of the Interstate Commerce Commission and are beyond the jurisdiction of the state.

Solons Do Not Indorse Uniform Truck Limits

Harrisburg meeting declares interest of motorists and tax payers is paramount

What appeared to be an elaborate and determined effort on the part of combined commercial motor vehicle interests to induce representatives of the legislatures of seventeen states in the North and East to place themselves on record as favoring the code of motor vehicle limitations similar to that recommended by the American Association of State Highway Officials, met with failure at Harrisburg, Pa., on October 21 when the legislators' conference adjourned after refusal to take such action. The meeting was held under the auspices of the American Legislators Association and the chairmanship of Henry W. Toll, executive director of the association, in response to a resolution adopted by the Pennsylvania Legislature asking the association to call the meeting.

Mr. Toll, in outlining the purpose of the meeting on October 20, seemed to assume that there was no question regarding the advisability of uniformity among the 17 states represented at the conference. The codes of limitations presented—four in all—which were published in the agenda for the meeting emanated from automotive sources, the United States Bureau of Public Roads and the American Association of State Highway Officials and all are practically identical except in the variation recommended for permissible lengths of combinations of vehicles; none of them recommends a permissible axle loading of less than 9 tons on balloon tires.

The first speaker was Governor Pinchot of Pennsylvania, who urged the legislators to proceed on the belief that the use of the highways by the general public is its fundamental use and that all other uses must be subordinated thereto. He condemned the occupation of the highways by gigantic trucks and said that the convenience of the average man should control public policy. Governor Pinchot was followed by William J. Cunningham, professor of transportation at Harvard University. Professor Cunningham, who served as secretary of the so-called Atterbury-Swayne Committee, which endeavored to bring agreement between railroad and truck interests on the subject of motor transport regulation and taxation, expressed his disappointment at the fact that the truck interests would not concede adequate regulation and that the railroads would not acquiesce to the code of limitations recommended by the American Association of State Highway Officials, which code he spoke well for "in principle".

E. N. Smith, vice-president of the American Automobile Association, was the next speaker. Although claiming to represent private motorists, he asserted that such drivers are entirely willing to share the highways with buses and trucks. He favored uniformity in limitations as provided for in the highway officials' code and expressed concern lest interstate commercial traffic on the highways be seriously impeded by "punitive" legislation.

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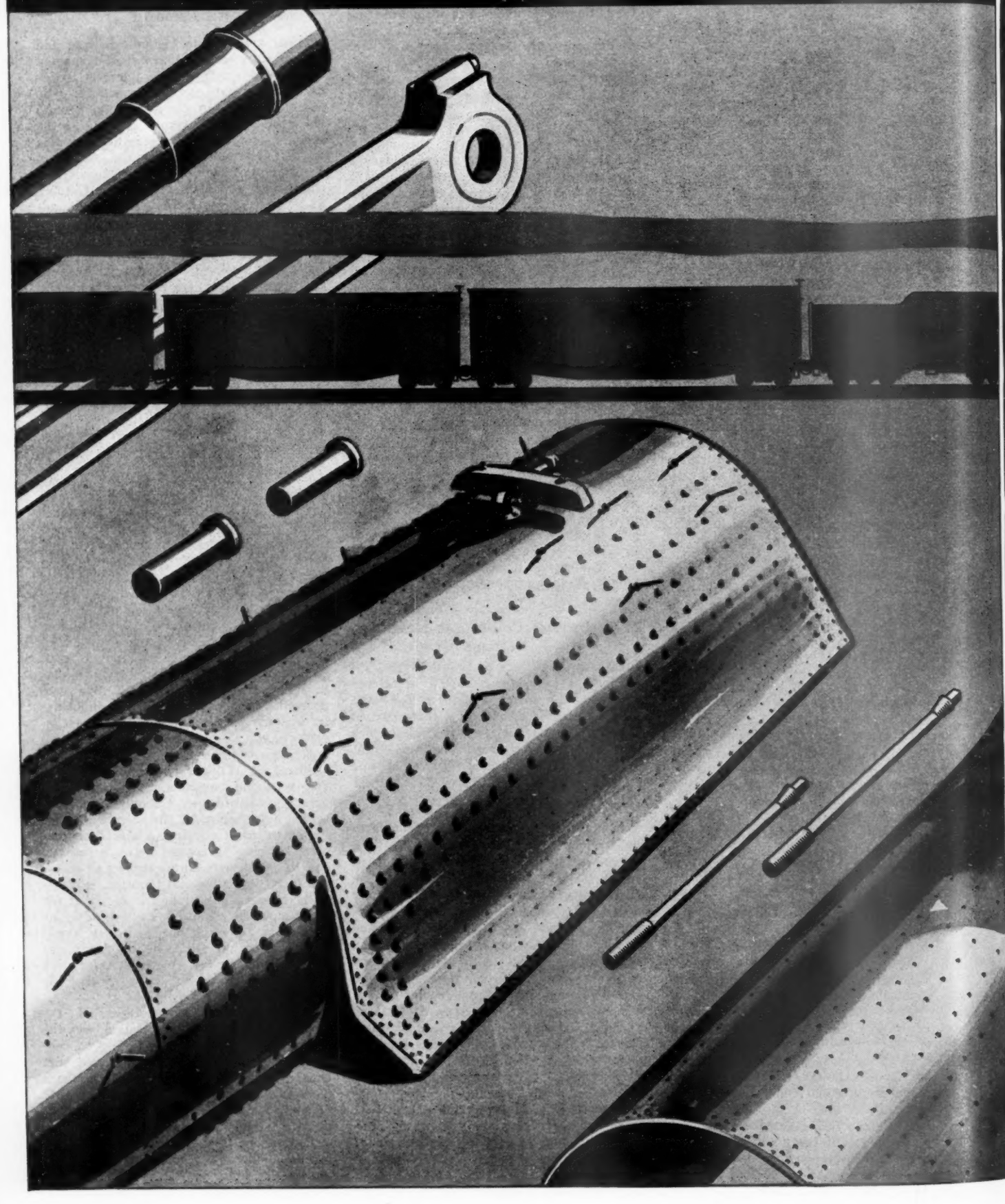
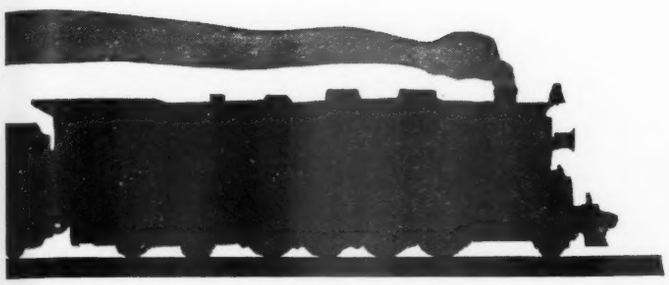
BETTER MATERIALS



WILL LOWER YOUR COSTS



Whether you build new equipment or repair the old, economy demands modern materials. » » » Why replace worn and broken parts with the same materials and have them soon again requiring repairs? » » » When axles, rods and pins encounter higher stresses, there are Agathon Alloy Steels of greater strength and fatigue resistance to meet the new demands. » » » Modern Agathon Alloy staybolts have the increased tensile strength required by present-day boiler pressures. They are doubling the mileage per staybolt renewal for progressive railroads. » » » For case-hardened parts, Republic metallurgists have perfected Agathon Nickel Iron which provides a tougher core which, in turn, means fewer breakages. » » » Firebox sheets of Toncan Iron resist corrosion and fire-cracking. This alloy of refined iron, copper and molybdenum has substantially extended the life of side sheets. » » » In these and many other instances, Republic metallurgists have developed special alloy irons and steels that are improving locomotive performance and lowering maintenance.

Toncan Iron Boiler Tubes, Pipe, Plates, Culverts, Rivets, Tender Plates and Firebox Sheets • Sheets and Strip for special railroad purposes • Agathon Alloy Steels for Locomotive Parts • Agathon Engine Bolt Steel • Agathon Iron for pins and bushings • Agathon Staybolt Iron • Climax Steel Staybolts • Upson Bolts and Nuts • Track Material, Maney Guard Rail Assemblies • Enduro Stainless Steel for dining car equipment, for refrigeration cars and for firebox sheets • Agathon Nickel Forging Steel.

The Birdsboro Steel Foundry & Machine Company of Birdsboro, Pa. has manufactured and is prepared to supply, under license, Toncan Copper Molybdenum Iron castings for locomotives.

CENTRAL ALLOY DIVISION, MASSILLON, OHIO

AGATHON STEELS TRADE MARK

REPUBLIC STEEL CORPORATION

GENERAL OFFICES YOUNGSTOWN, OHIO

TONCAN COPPER MOLYBDENUM IRON

The next speaker was billed as a representative of the shippers, but the individual selected to present this viewpoint was Roy F. Britton, director of the National Highway Users Conference, a truck propaganda organization in Washington, D. C. Although the subject for the meeting was proposed uniformity of limitations on motor vehicles, Mr. Britton devoted a large part of his time to condemning the railroads. He yielded some of his time to a representative of the International Association of Milk Dealers who objected to uniformity as proposed in some of the codes because his association desires to exceed these limitations and operate trains of two or three trailers.

Ted Rogers, president of the American Truck Association, Inc., mentioned a long list of associations which he said favored the proposed code, including inaccurately the Atterbury-Swayne Committee and the Chamber of Commerce of the United States. He favored a code more liberal than those proposed and declared that the railroads are out to acquire a monopoly of all transportation. He said that truck operators favor regulation but only that which would promote their own interests. The roads were made primarily for business, he declared, and business means trucks; the highways were not intended as "joy ways".

S. G. McNees, counsel for the Pennsylvania Bus Association, made a temperate presentation of the point of view of bus operators, asserting that buses curtail highway congestion since the bus takes up much less highway surface per passenger that the passenger automobile.

W. H. Bearley, of the Autocar Company, spoke for the truck manufacturers. Pierre Schon, transportation engineer, General Motors Truck Company, gave a talk illustrated by wall maps showing the diversity of state regulation of weights and dimensions of commercial vehicles. A representative of Thomas H. McDonald, Chief of the Bureau of Public Roads, told of the desire of that Bureau to have uniformity of sizes so that they could provide uniformity of road design.

After two or three hours had been devoted to an exposition of the motor transport side of the case, twenty minutes were allowed to John J. Pelley, president of the New York, New Haven & Hartford, to present the views of competing forms of transportation. Mr. Pelley said that the railroads have an interest in this question because they are such heavy taxpayers and that if vehicles are allowed to operate on the roads which unduly damage them or increase construction costs, the taxpayers have to foot the bill. He drew attention to the fact that a vehicle of a pretty substantial size could circulate safely in all the states represented at this conference and to that extent uniformity was already possible; apparently what was meant by uniformity in this instance was uniformity on a much higher basis than that now permitted. He attacked the formula for determining gross maximum weights in the code and said that no layman and but few engineers could understand the formula and that it would be impracticable to police the weights of vehicles under it. The effect of heavy vehicles on the taxpayers he illustrated by citing the fact that whereas the Pennsylvania State Highway Department had estimated at $52,000 per mile the cost of a super-highway such as is favored by the trucking interests, they had actually been building highways suitable in every way for smaller vehicles at a cost of $6,000 a mile and had built 7,000 miles of roads of this character for $42,000,000 which, if they had been designed for heavy trucks, would have cost the taxpayers $364,000,000.

No representative of the taxpayers, other than Mr. Pelley, had a place on the program.

Following the presentation of these views, the delegates were called upon for an expression. Speaker Earl Crawford of the Lower House of the Indiana Legislature referred to a table in the agenda showing the weight limitations in the seventeen states at the present time and called attention to the fact that the average gross weight now permitted was 17 tons, whereas the code would more than double it. He suggested that the proposed code was being used to mislead the legislators and that it was a question which the taxpaying citizens should first decide for themselves.

The New Hampshire delegate said that whereas his state had a highway mileage equal to that of Massachusetts, the latter state exceeded it in wealth and population twelve to fourteen times. He inquired how the taxpayers of New Hampshire could be expected to finance the same standards of road construction which Massachusetts might well be able to afford. The state now has only 500 miles of so-called "standard" highways. A count of the vehicles registered in that state between five and ten tons gross weight (the maximum now permitted) projected to indicate the probable number of registrations over ten tons if permitted, he said, indicated that the state would not get ten cents on the dollar from additional taxes for the expense to which it would be put in providing for heavier vehicles.

Harold G. Hoffman, Commissioner of Motor Vehicles of New Jersey, suggested that uniformity might be secured by liberal federal aid to states which would conform. James M. Mathew, Jr., of the Ohio delegation expressed the opinion that as far as Ohio was concerned there should certainly not be any increase in maximum sizes and weights but that there should be, if any change, a reduction. R. A. Pollock of the same delegation stated that contiguous states practically have uniformity at the present time and he raised a question as to the purpose of the conference.

W. H. Scott, speaking for the Virginia delegation, stated that the Virginia public does not desire to build heavier roads and that their highway engineers do not agree with the arguments which have been advanced for the proposed code. The spokesman for the West Virginia delegation said that there were less than 60 vehicles of over five tons' capacity registered in that state.

On the second day of the conference resolutions were adopted to the following effect: 1. That the conference had developed a variance of opinion as to proper weights and dimensions limitations on motor vehicles; that the interest of taxpayers and operators of non-commercial vehicles whose welfare must come first had not been given proper consideration and that further study of the proposals was needed before conclusions could safely be reached. 2. That there is a "tendency" toward reduction in weight and size limitation instead of an increase. 3. That, since sentiment and research have not been sufficiently developed to justify any recommendation as to weights and sizes, it is recommended that representatives of smaller groups of states be appointed to confer further on the subject under the direction of the American Legislators Association.

The resolutions were adopted with no dissenting votes—New Jersey, Connecticut and Vermont not voting. Chairman Toll asked that the sectional groups get together and discuss what they wished to do. After some debate which indicated that many of the delegates did not feel that further conference was necessary, they agreed to confer for fifteen minutes in the following groupings; 1. the New England States; 2. New York, New Jersey, Pennsylvania and Maryland; 3. Delaware, Virginia, West Virginia and the District of Columbia; 4. Ohio, Illinois, Indiana, Michigan and Pennsylvania.

The groups returned to report that the territory covered by the conference was too great to permit a single solution and urged that the resolutions as adopted be forwarded to the interested states. Group 4 also expressed a desire that Kentucky and Wisconsin be included in it.

At a dinner held in the evening of the first day of the conference, there were addresses by Co-ordinator Joseph B. Eastman and John S. Worley, professor of transportation of the University of Michigan. The subject of Professor Worley's address was motor vehicle taxation. A report of Co-ordinator Eastman's address appears elsewhere in this issue.

Milwaukee Machine Shop Burns

Fire, which started in electrical wiring, damaged the machine shop of the Chicago, Milwaukee, St. Paul & Pacific at Deer Lodge, Mont., on October 21, to the extent of $200,000, several stalls in the roundhouse and some machinery being involved. To these shops, which are on the electrified portion of the railroad, are assigned most of the work on electric locomotives, but at the time of the fire no motors were in the building.

Movement of C. C. C. Represents Big Transportation Task

The task of discharging men from the Civilian Conservation Corps as a part of the program for rebuilding the corps for the winter has been virtually completed, it was announced on October 21 at the office of Robert Fechner, director of emergency conservation work. Up to that date, according to reports received by the War Department from the nine Army Corps areas, a total of 123,346 men had been discharged or sent to their home states for discharge. A total of between 125,000 and 130,000 discharges was anticipated, and the work of enrolling new men in the various states to take the places left vacant by the discharge of men leaving was progressing.

Officers of the rail transportation section of the Quartermasters Corps of the War Department said that a total of 31,275 men have been moved from California and other western seaboard states to New

York and other states in the east. This group was a part of a contingent of 53,000 men sent across the continent to the west coast last Spring. About 70 per cent of this group left the corps at the end of the first six months enrollment period. The movement of discharged men home, the transportation of new men to the forest camps and the transfer of 549 companies from abandoned camps to new locations has furnished the rail transportation section with a big task. Officials of this section estimate that approximately 250,000 men will have been moved by the time the last of the 1468 camps has been established in winter quarters.

Possibility of Holding World's Fair in 1934

As a result of public feeling that A Century of Progress Exposition should be re-opened in 1934, officers of the exposition are circularizing railroad exhibitors to determine whether the railroads will be willing to re-exhibit next year.

The Exposition opened on May 27 and was scheduled to close on October 30, but the continued interest and attendance have extended the closing date to November 12. As a result of this extension, the railroads which established especially low rate fares into Chicago for the exposition have extended the expiration date from October 30 to November 12.

Equipment Installed

Class I railroads in the first nine months of 1933 placed in service 1,872 new freight cars, the Car Service Division of the American Railway Association has announced. In the same period last year 2,679 new freight cars were placed in service. The railroads on October 1 this year had 275 new freight cars on order, compared with 1,275 on the same day last year. The railroads placed one locomotive in service in the first nine months this year, compared with 36 in the same period in 1932. New locomotives on order on October 1 this year totaled one, compared with four on the same day last year. Freight cars and locomotives leased or otherwise acquired are not included in the above figures.

Freight Traffic 5.7 Per Cent Greater Than Last Year

The volume of freight traffic handled by the Class I railroads in August, measured in net ton-miles, showed an increase of 31.9 per cent above the same month in 1932, according to reports compiled by the Bureau of Railway Economics. Freight traffic in August amounted to 26,468,468,000 net ton-miles, compared with 20,070,794,000 net ton-miles in August, 1932. Compared with the same month in 1931, however, the volume of freight traffic in August this year was a reduction of 2,892,929,000 net ton-miles or 9.9 per cent. In the Eastern district, the freight traffic handled in August was an increase of 41.3 per cent compared with the same month in 1932, while the Southern district reported an increase of 27.7 per cent, and the Western district, an increase of 20.5 per cent.

Freight traffic handled by the Class I railroads in the first eight months of 1933 amounted to 176,605,876,000 net ton-miles, an increase of 9,508,205,000 net ton-miles, or 5.7 per cent, over the corresponding period in 1932, but a reduction of 57,375,013,000 net ton-miles, or 24.5 per cent, under the corresponding period in 1931. Railroads in the Eastern district for the eight months period in 1933 reported an increase of 7.2 per cent in freight traffic compared with the same period in 1932, while the Southern district reported an increase of 7.7 per cent. The Western district reported an increase of 2.8 per cent.

Merger of Truck Associations In Effect

In a general appeal to all trucking associations to affiliate with the American Trucking Associations, Inc., to the end that a code for the trucking industry under the national industrial recovery act may be obtained, Ted V. Rodgers, president of the organization, has announced that truck associations in 37 states have approved the merger of the American Highway Freight Association and the Federated Truck Associations of America into the new association. Representatives of the association have been conferring with officials of the National Recovery Administration on details of the proposed code preliminary to the public hearing on it.

Association of Practitioners Before the I. C. C.

The fourth annual meeting of the Association of Practitioners Before the Interstate Commerce Commission was held at Washington on October 19 and 20. R. C. Fulbright, in his address as president, advocated a simplification of proceedings before the commission by getting away from the conception of "pseudo-court" procedure, saying the question has arisen as to whether this has not failed with the development of the magnitude and complexity of transportation problems. He suggested a procedure of investigation by attorneys and examiners in advance of formal hearings and the substitution of written statements for much of the kind of evidence now submitted at oral hearings. C. E. R. Sherrington, secretary of the Railway Research Service, of London, England. gave an address on the co-ordination of transportation in Great Britain, along the lines of his recent addresses before the New York and Chicago traffic clubs. P. J. Farrell, chairman of the Interstate Commerce Commission, in an address of welcome urged that the members of the association persuade Congress to provide for co-ordination of transportation agencies by the enactment of legislation to prevent men in transportation from injuring each other.

The association went on record in favor of the adoption by the Interstate Commerce Commission of a system of written examinations to test the fitness of applicants for admission to practice before it, although it had shortly before received notice that the commission was not in favor of such a plan. Walter McFarland, general attorney of the Chicago, Burlington & Quincy, was elected president of the association for the ensuing year.

Associated Traffic Clubs Meeting at Baltimore, Md.

The twelfth annual meeting of the Associated Traffic Clubs of America was held at the Lord Baltimore Hotel, Baltimore, Md., on October 24 and 25, with 500 delegates and guests, representing more than 50 traffic clubs, in attendance. Presiding in turn were the Associated Traffic Clubs' president, H. W. Roe, traffic manager of the Mid-Continent Petroleum Corporation, Tulsa, Okla., and its executive vice-president, J. M. Fitzgerald, vice-chairman of the Committee on Public Relations of the Eastern Railroads. Addresses at the convention's sessions were delivered by Daniel Willard, president of the Baltimore & Ohio, and Roger Lapham, president of the American Hawaiian Steamship Company, while Joseph B. Eastman, federal co-ordinator of transportation, spoke at the banquet on the evening of October 24.

At the election of officers, held on October 25, the present incumbents were re-elected, with the exception of Vice-President L. C. Sorrell, professor of transportation at the University of Chicago, who has been succeeded by G. Lloyd Wilson, professor of commerce and transportation at the University of Pennsylvania. The complete list of officers follows: President, H. W. Roe, traffic manager of the Mid-Continent Petroleum Corporation, Tulsa, Okla.; chairman of the board of directors, H. A. Palmer, editor and manager of the Traffic World, Chicago; vice-presidents, J. M. Fitzgerald, vice-chairman of the Committee on Public Relations of the Eastern Railroads, New York; M. M. Goodsill, general passenger agent of the Northern Pacific, St. Paul, Minn.; J. T. Saunders, vice-president of the Southern Pacific, San Francisco, Cal.; H. S. Snow, vice-president of the American Zinc, Lead & Smelting Company, St. Louis, Mo.; G. Lloyd Wilson, professor of commerce and transportation at the University of Pennsylvania; A. W. Vogtle, manager of the traffic and sales of the De Bardeleben Coal Corporation, Birmingham, Ala.; secretary, F. A. Doebber, traffic manager of the Citizens Gas Company, Indianapolis, Ind.; treasurer, W. T. Vandenburgh, commercial agent of the Seaboard Air Line, Louisville, Ky.

Six members of the board of directors were also chosen. Charles Barham, vice-president of the Nashville, Chattanooga & St. Louis, Nashville, Tenn.; J. B. Large, assistant general traffic manager of the Pennsylvania, Philadelphia, Pa.; A. S. Lucas, general agent of the Natchez Route, Birmingham, Ala., and B. E. Olsen, traffic manager of the McCall Company, Dayton, Ohio, were re-elected, while W. Y. Wildman, manager of the Illinois Coal Traffic Bureau, and M. A. Keith, general traffic manager of the International Stacey Corporation, Columbus, Ohio, were chosen to places vacated by R. W. Campbell, manager of the traffic department of the Butler Paper Corporation, Chicago, and J. W. Roberts, perishable traffic manager of the Pennsylvania, New York. It was decided

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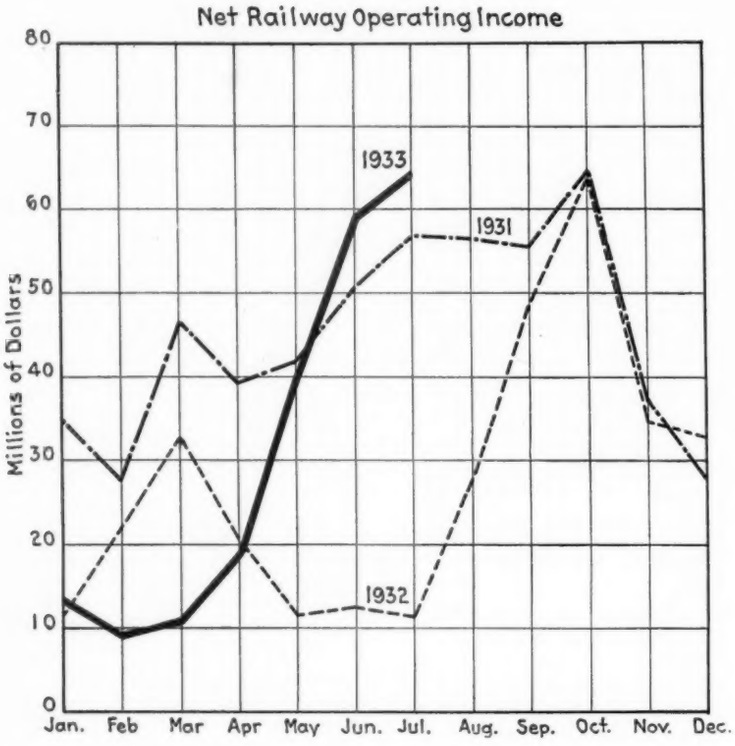
ECONOMY OF

Increased Earnings Reflect Skillful Management And The Wisdom of Planned Economies



CAREFUL analysis of this year's operation will show that net earnings are increasing at a faster rate than car loadings.

This means that railroads are beginning to reap the benefits of economies planned several years ago —low cost operation made possible by the elimination of non-paying service, obsolete equipment and the replacement of ordinary wearing parts with super-service materials.

It is significant that practically all railroads showing substantial improvement in net earnings specify HUNT - SPILLER *Air - Furnace* GUN IRON for the vital parts of their locomotives.

HUNT - SPILLER *Air*

OPERATION-

Savings Effected by H S G I Have Proven To Be A Contributing Factor

EVERY search for reductions in the cost of locomotive maintenance and fuel consumption has emphasized the necessity for complete standardization of HUNT-SPILLER *Air-Furnace* GUN IRON wearing parts.

Railroads have discovered that the locomotives completely equipped cost less to maintain, consume less fuel, handle trains better and turn in maximum revenue mileage between repairs.

Problems created by increased pressures, temperatures, weights and long locomotive runs have been solved by the application of HUNT-SPILLER *Air-Furnace* GUN IRON parts.

DUPLEX Sectional packing for the valves and cylinders has proven to be an outstanding contribution. Unusual economies are being reported on the service performed by this sectional packing.

HUNT-SPILLER MFG. CORP. are constantly working in the interest of the railroads—a new light-weight valve has been developed which offers large savings in the maintenance of piston valves — savings which your road will appreciate. Try a test installation. Complete details upon request.

H S G I Wearing Parts

Duplex Sectional Packing
For Locomotive Cylinders

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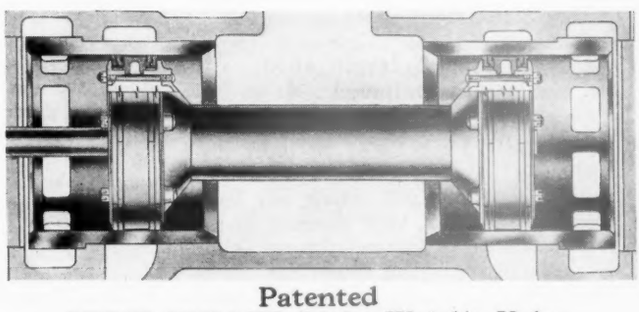
For Locomotive Valves



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to hold the next meeting at Birmingham, Ala., the date to be determined later by the board of directors.

Committee to Advise Eastman on Labor Problems

Co-ordinator Eastman has announced the appointment of an advisory committee in connection with his study of railroad labor problems. This committee will advise with O. S. Beyer of the co-ordinator's staff, who is handling railroad labor research and relations. The members of the committee have been gathered from some of the leading universities and colleges, the United States Department of Labor, and the Social Science Research Council. All have agreed to serve on the committee without compensation.

Thorough consideration of the whole railroad employment situation is particularly important at this time, he said, not only because the emergency railroad transportation act directs the co-ordinator to study the problem of improving railroad labor conditions and relations and the stability of employment, but also because plans looking towards the rehabilitation of the railroads may vitally affect railroad employment. The committee will particularly consider the effect on labor of labor-saving economies, and the means which may be available for alleviating this effect.

Those who have agreed to serve on the advisory committee are as follows: Dr. J. Douglas Brown, director of the Industrial Relations Section, Princeton University; Dr. Meredith B. Givens, secretary for industry and trade, Social Science Research Council; Dr. Walton H. Hamilton, professor of law, Yale University; Dr. Alvin H. Hansen, professor of economics, Employment Stabilization Research Institute, University of Minnesota; Dr. William Leiserson, professor of economics, Antioch College; Dr. Isador Lubin, United States Commissioner of Labor Statistics; Dr. David A. McCabe, Chairman, Department of Economics and Social Institutions, Princeton University; Dr. Isaiah L. Sharfman, chairman, Department of Economics, University of Michigan; Dr. Sumner Slichter, professor of business economics, Harvard School of Business Administration; Dr. William Stead, associate director, United States Employment Service.

Hoch-Smith Investigation Discontinued

The Interstate Commerce Commission on October 23 announced an order discontinuing its general rate structure investigation, No. 17,000, which was instituted on March 12, 1925, pursuant to the joint resolution of Congress known as the Hoch-Smith resolution, except for orders already made in that proceeding, or which may be entered in respect of such orders as supplementary or ancillary thereto, and except for those parts of the proceeding which have been heard or upon which testimony is being heard, and not yet submitted.

In its efforts to carry out the mandate of the resolution the commission later divided its investigation into 13 parts, as separate inquiries covering class rates of important commodities or commodity groups. Reports have been adopted by the commission as to most of the separate parts of the investigation but several parts are still in various stages due to the reopening of earlier proceedings, as in the western grain investigation in which the commission's order was set aside by the courts and a rehearing ordered. The rehearing was concluded on October 6 in Chicago after over 89,000 pages of testimony had been taken over a period of about six years.

In its annual report last year the commission said that, generally speaking, the Docket 17,000 cases have developed into unwieldy proportions and that its experience with them has indicated that the country is too big to make it generally practicable to deal with it as a whole or even with the major classification territories, except in proceedings especially adapted to such treatment, and that such large proceedings should be initiated in the future only sparingly and in response to imperative needs which can be met to advantage only in that way.

Completion of Montreal Terminal Debated

With $16,000,000 already spent on the Canadian National $50,000,000 terminal in Montreal the municipal authorities of that city have decided to take steps to get a final decision from the Dominion government, which of course has to find the money for the publicly-owned railway's project, either for final and complete abandonment of the scheme or its resumption and completion.

Because of a nation-wide complaint about the projected cost of the new terminal at a time when money was scarce the present Bennett government, shortly after it assumed office in the fall of 1930, ordered cessation of work. A large amount of construction, including the excavation out of solid rock of the site for the great terminal and office building on Dorchester Street, just east of Dominion Square, and a large amount of grade separation work in the west end of the city, had been done and the cost to date is estimated at approximately $16,000,000.

What has driven the city of Montreal to desperation is not so much that the terminal itself remains uncompleted but that the city's street system in the west end is left up in the air with a partially finished scheme of grade separation. Some streets still cross the Canadian National tracks on the level, others cross by tunnel or viaduct, and the whole system of communications in that area is disrupted and in a state of uncertainty.

To get some finality the city has instructed its solicitor, W. H. Butler, to file with the Dominion Railway Board at Ottawa a petition seeking grade separation at St. Henri and some other points in the west end. The city will demand "a tunnel or tunnels." That question will at once involve the terminal scheme since the question of levels arises and it must be decided whether the subways are to go deep enough to accommodate railroad tracks at their existing surface level or whether elevated tracks are to be taken into consideration.

Equipment and Supplies

LOCOMOTIVES

THE GREAT NORTHERN is repairing five mallet type locomotives in its own shops, the work involving the installation of new boilers.

THE BEAVER VALLEY has ordered from the Fate-Root-Heath Company a Plymouth gasoline locomotive of the ML model, 30-ton, 4-wheel, 4-speed gear drive, powered with a 6-cylinder Le Roi engine, rated at 175 hp. at 1,000 rpm.

FREIGHT CARS

THE DETROIT, TOLEDO & IRONTON is asking for prices on material to be used in the modernizing of from 100 to 300 U. S. R. A. box cars in its own shops.

PASSENGER CARS

THE ABERDEEN AND ROCKFISH has ordered one combination passenger and baggage rail motor car from the J. G. Brill Company.

IRON AND STEEL

THE DELAWARE AND HUDSON has ordered 200 tons of steel for a bridge at Greenwich, N. Y., from the American Bridge Company.

THE NORFOLK & WESTERN has placed orders for 10,000 tons of 131-lb. steel rail. The orders were divided between the Carnegie Steel Company who will furnish 7,500 tons and the Bethlehem Steel Company who will furnish 2,500 tons.

RAIL.—The leading steel rail manufacturers have filed a schedule reducing the price of rail $2.25 a ton, making the new price for rail $37.75. A previous reduction in the price of rail from $43 a ton to $40 was reported in the *Railway Age* of October 29, 1932, the first change in rail prices during a period of ten years.

SIGNALING

THE ERIE has ordered from the Union Switch & Signal Company 37 searchlight signals with relays, rectifiers and other apparatus, to be installed on its line, double track, between Suffern, N. Y. and Newburgh Junction, replacing semaphore signals.

MISCELLANEOUS

PARIS-ORLEANS OF FRANCE.—The Locomotive Firebox Company has just received an order from this road for 12 Nicholson thermic syphons for application to Series 4500 Pacific-type locomotives which are being converted to the 4-8-0 wheel arrangement. The first of these locomotives was syphon equipped last year and, as a result of satisfactory service tests, syphons will

be installed in the 11 additional engines now being rebuilt. The syphons will be manufactured by the Compagnie Generale de Construction de Locomotives, Paris, and will be applied in the railway company shops at Tours. In addition to this order, the Paris-Orleans is inquiring for 20 syphons for its Series 3700 Pacific-type locomotives. One of these locomotives was rebuilt, including the application of syphons, in 1927, and the recent inquiry will supplement orders for 22 syphons already installed in this class of power.

Supply Trade

C. R. Myer was elected vice-president of the **General Cable Corporation,** New York, at a meeting of the board of directors on October 19.

W. S. Gain, 416 Lafayette Building, Buffalo, N. Y., and **E. A. Thornwell,** 217 Whitehall street, Atlanta, Ga., have been appointed district representatives of the magnet department for the **Ohio Electric Manufacturing Company,** Cleveland, Ohio.

N. R. A. Codes

The President has approved a code of fair competition under the national industrial recovery act for the steel tubular and firebox boiler industry. A revised code for the structural steel and iron fabricating industry has been set for hearing on October 30.

OBITUARY

William McConway, Jr., chairman of the board of the McConway & Torley Corporation, Pittsburgh, Pa., died on October 16.

Charles N. Wood, senior partner in the Charles N. Wood Company, Boston, Mass., and for many years New England sales representative of Wm. Wharton, Jr., & Co., Inc., the Railway Track Work Company, General Grinding Wheel Corporation, Una Welding & Bonding Company and other manufacturers of railroad and electric railway equipment, died at Brookline, Mass., on October 22, at the age of 70.

Herbert H. Dewey, vice-president of the International General Electric Company, Inc., died at his home in Schenectady, N. Y. on October 25 after a short illness. Mr. Dewey was graduated from St. Lawrence University in 1904. He joined the General Electric Company three years later as a student engineer, subsequently serving in the power and transmission section of the power and mining department and had charge of that section from 1916 to 1921. He was then assistant engineer of the central station department. In 1927, he went to Russia for this company and in December of the following year was appointed vice-president of the International General Electric Company, with supervision over all interests of the company in connection with the Russian business.

Myron F. Westover, who retired in 1928 after having been secretary of the General Electric Company for 34 years, died at his home in Schenectady, N. Y., on October 21. Mr. Westover was born near Vinton, Iowa, in 1860. He was graduated from the law school of the University of Iowa, and in 1882 was admitted to the bar. Four years later he went to Boston, and in 1888 became secretary to Charles A. Coffin, then treasurer and manager of the Thomson-Houston Electric Company, a predecessor of the General Electric Company. In 1893, Mr. Westover was elected assistant treasurer of the new General Electric Company, and in the following year was elected secretary.

Construction

CHICAGO & NORTH WESTERN.—A contract has been awarded to the S. G. Cool Company, Chicago, for the construction of reinforced concrete abutments for a highway subway under the tracks of this company at Womac, Ill.

NEW YORK CENTRAL.—This company has been directed by the New York Public Service Commission to submit not later than November 15, a revised general plan for the elimination of the Carman crossing in Schenectady county, N. Y. The elimination of the crossing was ordered by the commission in 1927; litigation instituted by the town of Rotterdam delayed the work about five years. The courts have now sustained the orders of the commission providing for the elimination.

NORTHERN PACIFIC.—Following negotiations with the various states through which it passes, this railroad has announced an extensive grade-crossing elimination program involving, to date, the construction or replacement of 15 grade separation structures. In each case the entire cost of the construction will be paid by the state from funds obtained from the public works administration. At Scanlon, Minn., and Glenwood and Eckelson, N. D., present subway structures with center piers will be replaced with single-span structures, thus eliminating the center piers. At Craigmont, Idaho, it is proposed to replace a highway subway under a double-track line with a steel bridge supported on concrete masonry. The construction of highway overpasses is planned at Fallon, Mont., Bozeman and Ravalli, and at Almira, Wash., Attalia and Reservation, while it is proposed to replace highway overpasses at Helena, Mont., and DeSmet with new structures. Other grade separations are planned at Logan, Mont., and Mullen and Moscow, Idaho, while additional structures are under consideration.

PENNSYLVANIA.—This road has been directed by the New York Public Service Commission to submit plans, specifications and estimates of cost for the elimination of its South Main street, Miller street, South avenue and LaFrance street crossings in Elmira, N. Y.

UNION PACIFIC SYSTEM.—Plans are being prepared for highway subways at Ragan, Wyo., Black Wolf, Kan., Hammett, Idaho, Pocatello, Nampa and Idaho Falls, while the Colorado Highway Commission is preparing plans for viaducts over this company's tracks at Julesburg, Colo.; River Bend and Beta. Plans have also been completed for a subway at Dishman, Wash. In each case it is proposed to finance the structures with the aid of highway funds furnished to the states by the federal government.

WABASH.—Contracts have been awarded for the construction of four reinforced-concrete highway subways at various points on this company's lines. The location and estimated cost of each project, together with the successful contractors, are as follows: North Main street, Decatur, Ill., Roy W. Christy, $91,000; State Highway 77, Robertson, Mo., M. F. Longwill, $60,000; Vine street, Urbana, Ill., Walsh Construction Company, $45,000; and State Highway 127, Raymond, Ill., Gould Construction Company, $42,000.

Financial

BALTIMORE & OHIO.—*B. R. & P. Order Modified.*—The Interstate Commerce Commission has issued a supplemental report relieving this company from the condition attached to the authorization to acquire control of the Buffalo, Rochester & Pittsburgh relating to the retention of existing routes and channels of trade. This was done on application of the company to permit it to file tariffs closing a number of routes as circuitous and uneconomical.

CHICAGO & NORTH WESTERN.—*Bonds.*—This company has applied to the Interstate Commerce Commission for authority for the authentication and delivery of $7,725,000 of first and refunding mortgage 5 per cent bonds for the purpose of retiring a like amount of bonds of the Fremont, Elkhorn & Missouri Valley.

CHICAGO AND WESTERN INDIANA.—*Bonds.*—The Interstate Commerce Commission has authorized this company to issue $1,700,000 of first and refunding 5½ per cent series C bonds to be delivered to the Burlington South Chicago Terminal in lieu of cash in payment for the property of the latter company. The issue is guaranteed by the C. & W. I.'s proprietor railroads.

CHICAGO, ROCK ISLAND AND PACIFIC.—*Trustee Requested.*—Two motions with respect to the Rock Island, which filed a voluntary petition in bankruptcy last June, were taken under advisement on October 24 by Federal Judge James H. Wilkerson, at Chicago. One motion on behalf of the Reconstruction Finance Corporation and five bondholders' committees representing $250,000,000 in liens asked the appointment of an impartial trustee. The other, filed on behalf of the Rock Island, seeks to restrain certain New York and

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and Earnings by Purchasing Now

Adequate Protection of Cars and Lading Demands Modern, Efficient Devices

An Efficient Draft Gear must absorb light and heavy blows, and reduce to a minimum the shocks transmitted to the car structure: The capacity to do this must not be lessened by wear of the friction surfaces . . .

NATIONAL M-17-A Draft Gears

by the gradual building up of frictional resistance, cushion *all* the blows with a smoothness of action that ensures the maximum protection to Cars and Lading, and reduces maintenance cost and damage claims.

Initial Spring Compression compensates all frictional wear and makes readjustment of gear unnecessary

For the satisfactory performance of these gears, the American Railroad Association, Division 5, Mechanical, has issued to this company their Certificate of Approval

NATIONAL MALLEABLE AND STEEL CASTINGS COMPANY

General Offices: CLEVELAND, OHIO

Sales Offices: New York, Philadelphia, Chicago, St. Louis, San Francisco

Works: Cleveland, Chicago, Indianapolis, Sharon, Pa., Melrose Park, Ill.

Chicago banks and the Reconstruction Finance Corporation from disposing of Rock Island bonds held as collateral for loans. The counsel for the bondholders, in asking for a trustee, contended that stockholders have been favored in preference to other creditors and that the bondholders want somebody who does not owe primary allegiance to the debtor company. In support of this contention, counsel stated that the management of the Rock Island paid a dividend in 1930 when it knew the company was headed for trouble. Marcus L. Bell, vice-president and general counsel for the Rock Island, stated that the appointment of an impartial trustee would not hinder the reorganization of the road, although there was no necessity for such action and that under present conditions there is no prospect for reorganization before a year.

ILLINOIS CENTRAL.—*Bonds.*—The Yazoo & Mississippi Valley has applied to the Interstate Commerce Commission for authority to extend the maturity date of $17,037,000 of its improvement bonds due January 1, 1934, for five years to January 1, 1939, and the Illinois Central has applied for authority to continue to pledge $16,554,000 of the bonds as collateral for loans from the Reconstruction Finance Corporation and the Railroad Credit Corporation.

MAINE CENTRAL.—*Acquisition.*—This company has applied to the Interstate Commerce Commission for authority to acquire control of the Portland & Rumford Falls and the Rumford Falls & Rangeley Lakes, now operated under lease, by purchase of stock through an exchange of securities.

READING.—*Bonds.*—The Interstate Commerce Commission has authorized this company to extend ten years from October 1, 1933, the maturity date of $2,644,000 of Philadelphia & Reading prior-lien mortgage bonds and to assume liability therefor.

SOUTHERN PACIFIC.—*Abandonment.*—This company has applied to the Interstate Commerce Commission for authority to abandon branch lines from Alamitos, Calif., to Almaden, 4 miles, and from Orogrande, N. M., to Zora, 4.7 miles.

WESTERN MARYLAND. — *Bonds.* — This company has applied to the Interstate Commerce Commission for authority to nominally issue $1,776,000 of first and refunding mortgage 5½ per cent gold bonds, to reimburse the treasury for capital expenditures in 1930 and 1931, to be held in the treasury until further order.

Valuation Reports

The Interstate Commerce Commission has issued final valuation reports finding the final value for rate-making purposes of the property owned and used for common-carrier purposes as of the respective valuation dates as follows:

Alameda Belt Line	$730,000	1928
Reader	225,000	1927
Burlington, Muscatine & Northwestern	170,000	1927
Winifrede	167,000	1927
Nashville & Atlantic	145,000	1928
Barre & Chelsea	470,000	1927
Baltimore & Eastern	750,000	1927
California & Oregon Coast	290,000	1927
Kansas & Oklahoma	110,000	1927
Rio Grande, Micolithic & Northern	105,000	1927

Railway Officers

Pitcairn Appointed Co-Receiver of Wabash

Norman B. Pitcairn, president of the Detroit, Toledo & Ironton, has been appointed co-receiver of the Wabash to serve with Frank C. Nicodemus, Jr., by the United States District Court at St. Louis. He succeeds Walter S. Franklin, who has resigned to return to the Pennsylvania as vice-president in charge of traffic, as announced in the *Railway Age* of October 21. The Pennsylvania is heavily interested in both the Wabash and the D. T. & I. and Mr. Pitcairn's appointment is a further reflection of the parent road's desire to maintain an active interest in the operation of the Wabash, which was first evidenced by the election of Mr. Franklin to the presidency of that road on October 26, 1931, to succeed the late William H. Williams.

For Mr. Pitcairn, the Detroit, Toledo & Ironton has been a proving ground to demonstrate his ability to pilot a railroad through a period of drastic declines in revenue. Since his election as president in January, 1931, operating revenues of the company dropped from $10,163,777 in 1930 to $5,754,167 in 1931 and to $4,130,256 in 1932, although so skillfully have expenses been controlled that the operating ratio increased only from 60.3 in 1930 to 70.1 in 1931 and 73.6 in 1932.

Norman B. Pitcairn

Mr. Pitcairn was born on November 8, 1881 at Harrisburg, Pa., and received his higher education at Princeton university. He first entered railway service on June 29, 1901 as a rodman on the Pennsylvania, being promoted to transitman in 1904 and to assistant supervisor of track in 1905. Five years later he was further promoted to supervisor of track and on November 10, 1919, he was appointed division engineer on the Pittsburgh division, being transferred to the Middle division in the following year and thence to the New York division in July, 1922. In October, 1923, Mr. Pitcairn was promoted to superintendent of the Erie & Ashtabula division, later serving in the same capacity on the Middle and the New York divisions. In July, 1928, he became general superintendent of the Eastern Ohio division, which position he held until January, 1931, when he was elected president of the Detroit, Toledo & Ironton, with headquarters at Dearborn, Mich.

Stanley P. Ruddiman, vice-president of the Detroit, Toledo & Ironton, has been elected president, with headquarters as before at Dearborn, Mich., to succeed **Norman B. Pitcairn,** who has been appointed a receiver of the Wabash.

OPERATING

H. E. Hinshaw, trainmaster of the McCook division of the Chicago, Burlington & Quincy, with headquarters at McCook, Neb., has been appointed acting assistant superintendent of the same division with the same headquarters, in which position he will temporarily assume the duties of **L. E. Caldwell,** superintendent at McCook, who is off duty because of ill health. **C. L. Gray,** chief clerk to the general manager, at Omaha, Neb., has been appointed acting trainmaster at McCook to replace Mr. Hinshaw.

TRAFFIC

W. H. Rabe, division freight agent for the Missouri Pacific, with headquarters at East St. Louis, Ill., has been promoted to general agent at St. Louis, Mo., to succeed **Thomas M. Callahan,** deceased.

MECHANICAL

C. M. House, superintendent of motive power and equipment of the Alton, has moved his headquarters from Bloomington, Ill., to Chicago.

OBITUARY

R. H. Fasen, superintendent of shops on the Union Pacific, with headquarters at Cheyenne, Wyo., died on October 20.

W. F. Every, general claim agent of the Northern Pacific at St. Paul, Minn., died on October 25.

A. I. Gauthier, assistant division engineer on the Boston & Maine, with headquarters at Concord, N. H., died on October 17.

W. J. Gillerlain, western passenger agent of the Norfolk & Western, with headquarters at Chicago, died suddenly at his home in that city on October 19.

Henry W. Miller, vice-president in charge of operation, materials and supplies, of the Southern, with headquarters at Washington, D. C., died in Bermuda on October 20.

L. V. Bright, vice-president of the Alabama, Tennessee & Northern, with headquarters at New York, died suddenly of a heart attack at his office in that city on October 23.